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Incandescent Lighting at the Munich Exposition.

(*Translated for the* REVIEW *from La Lumière Electrique.*)

The Munich Exposition presented a marked difference from the Paris Electrical Exposition, considered from a point of view regarding the artistic decoration of lamps. At the latter, the effort made to give the chandeliers and lamp-supports an appearance which should be pleasing to the eye seemed general, and this applied equally well to arc as to incandescent lamps.

The greater part of the arc lamps were enclosed within elegant lanterns, and the chandeliers with Siemens lamps, which ornamented the entrance to the exhibition, as also the one with Werdermann lamps in the theatre, and the numerous and varied arrangements for which the latter lamp was used will be remembered. As regards incandescent lamps, the solid mountings of Edison and his cut-glass chandeliers may be said to have vied with the elegant blown glass chandeliers of Swan.

At the Munich, however, very little by way of ornamentation was done for arc lamps, all efforts being, apparently, directed to incandescent lamps as if it had been assumed that they alone were suitable for domestic uses and that they were the only ones in need of ornamentation.

It appeared also, as regards arc lamps, that the only object sought was to exhibit systems without doing anything in the way of lamp decorations, and we have, therefore, but little to note in this connection except the Compton lamps,—a view of which was given in a previous number—a Schuckert lamp exhibited by Zettler and Soller, of Munich, and a drop light chandelier for Schuckert lamps similar to those used by Mr. Jaspar, and exhibited by Mr. Auspach, Foerderrenther and Company.

For incandescent lamps, however, it was quite otherwise, ornamental arrangements being exceedingly numerous, and it will readily be seen why this should be so. It is quite a difficult matter to give an artistic aspect to an arc lamp, or to group several of them in such a way as to form an elegant chandelier, while incandescent lamps, owing to their small dimensions, are admirably adapted for the most varied combinations. Incandescant lamps, moreover, can readily be fitted to the supports already in use for gas or candles, and the faculty which they possess for burning in any position, renders their installation still more easy. It was thus that the engineers were enabled to arrange in the restaurant garden a most original and picturesque lighting with Swan lamps, these being suspended among the leaves of trees and climbing plants. Being also attached by means of their conducting wires without any show of stiffness, and possessing, besides, a certain flexibility, on account of this mode of mounting, they participated in the movements of the leaves, and the garden, as in the story of the "Thousand and One Nights," seemed fairly lighted by the luminous fruit of magical trees.

FIG. 1.—SALOON FOR ART TREASURES LIGHTED BY A CHANDELIER OF INCANDESCENT LAMPS.

But this was only an ingenious arrangement showing further the facility with which incandescent lamps can be employed. To return to the apparatus, properly speaking, we will first have to consider the supports and devices for single lamps, and these were found at Munich just as they were at the Exposition of 1881.

Although the subject of considerable attention since that epoch, they have not changed but remain the same as then; we shall, therefore, not have to reconsider this part of the subject, but will occupy ourselves especially with the more complicated arrangements of electrical chandeliers, in the construction of which the designer's imagination has been given wide range.

And right here let us be permitted to digress a little with regard to these chandeliers, to protest against the word electrolier, which is beginning to be introduced in electrical language. It comes to us from the English; imitating our word chandelier, they have called every apparatus intended for holding lamps electrolier without perceiving that the letter *l* introduced in the termination belongs to the root of the word in chandelier, and that to be consistent with this mode of formation they should call poivvier, poivvelier; sucrier, sucrelier, etc. This mongrel word made its appearance about a year ago in the English electrical journals, and since then we have, not without astonishment, seen it repeated in French journals. Let us take from our neighbors, such as they are, such words as have no equivalent with us, but let us permit them to keep these terms which, though French in appearance, are forged by them contrary to all rule.

Electrical chandeliers were exceedingly numerous in the Munich Crystal Palace. The exposition having been connected with a decorative art exhibition, numerous manufacturers undertook to show that they could do quite as much for electricity as for gas and other methods of lighting, and the result was a multiplicity of different models.

Some of these were nothing more than gas chandeliers slightly modified to suit the circumstances, while others were specially designed for electric lamps; but what particularly struck the beholder was that nearly

all possessed fine artistic merit. The reason for this is to be found in the fact that the chandeliers although constructed for electric lamps were not, in the majority of cases, exhibited by electric light companies, but emanated generally from the artists of the country and represented one of the speciaities of local industry.

Munich, as is well known, is an artistic center, but the city does not content itself in merely giving hospitality to numerous painters and sculpturers, and in gathering within its museums the chief works of the old masters, it has in addition built up an industry in art objects. Furniture, utensils, forged irons of the middle age, etc., are reproduced with much skill and taste by the Bavarian artists, who, furthermore, do not lack for models.

The national museum of Bavaria, which is an immense museum something like the Cluny, contains, not huddled together, but classified in the most methodical manner, innumerable artistic riches which serve as so many models for the workmen.

It will therefore readily be understood that amid such surroundings, and with like resources, it was easy for the Munich exhibitors to combine the elegance of their chandeliers—an idea of which may be formed from the reproductions we give—with the brilliancy of the electric light.

Among the houses which were most distinguished for the production of chandeliers we must mention as in the front rank, the company for the manufacture of bronzes, known under the firm name of Spinn & Son, of Berlin ; Messrs. Schaefer and Hauschner, manufacturers of chandeliers, Berlin ; and L. A. Riedinger, of Augsburg, manufacturer of electrical machines.

The apparatus of the first two houses was used principally by the Edison Company, and their chandeliers were to be met with in all the sections reserved for that company.

We will mention, as an illustration of their productions, the chandelier in the saloon for art treasures, a view of which is given in Fig. 1, and the bracket light, Fig. 2, which was attached to one of the columns in the grand buffet of the restaurant. The chandelier with crystal pendants reminded one, in a manner, of those exhibited at the Exposition of 1881.

The bracket light with its opalescent lamps formed like corollas, presented an appearance which was both simple and elegent.

A very pretty chandelier, and one which perhaps attracted the most attention, is represented in Fig. 3. This was of wrought iron ornamented with glass flowers, to the lower part of which were attached incandescent lamps under disc reflectors of small volume. It combined elegance and a good arrangement of lamps.

A Tax on Brains.

Mr. Athol Maudslay, an English writer, discussing the matter of excessive charges for patent fees in England, says: "High fees for obtaining a patent not only discourage invention, but a high charge for patenting appears as though inventing were an offence punishable with a fine. The stamp duties and fees on and in connection with letters patent are as follow: On application with provisional specification—Stamp on petition for letters patent, £5; to be paid on giving notice to proceed, £5; to be paid on applying for warrant and patent, £10; stamp on final specification, £5; total cost of patent for three years, £25. On application with complete specification—Stamp on petition for letters patent, £5; stamp on complete specification, £5; to be paid on giving notice to proceed, £5; to be paid on applying for warrant and patent, £10—£25. Subsequent payments to continue the patent in force—Stamp on patent before expiration of third year, £50; stamp on patent before the expiration of seventh year, £100; total cost of patent for fourteen years, £175. And as most inventors are forced to employ an agent, there are the agent's charges to be paid in addition to the Government fees and stamp duties. The agent's charges on a fourteen-years' patent would amount from about £10 to £15; that is, supposing you made your own drawings, and drawings have to be lodged at the Patent Office in every case where a specification does not sufficiently describe the invention. So, in addition to the Government fees of £175, you have the agent's charges, the cost of models, experiments, drawings, working, advertising, and otherwise making known your invention, so that when a man intends taking out a patent, to make it worth his while to do so his invention must be worth quite £200 to leave him the smallest margin of profit. Under these circumstances, and with these oppressive and discouraging charges, it is wonderful to think that any one should be daring enough to become a patentee."

Electrical Transmission of Power.

The London *Daily News* of the 20th ult. says:

"M. Marcel Deprez made the other day a most successful application of his theories on the transportation of force at Grenoble. This city, being in a mountainous country, is surrounded by numerous streams and torrents

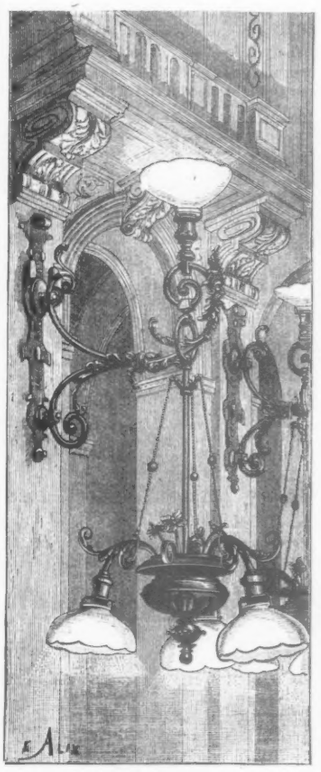


FIG. 2.

developing an amount of force which, if utilized, might be a source of immense wealth. The municipality of Grenoble invited M. Deprez to repeat the experiments which he had performed with success at Munich and at the Gare du Nord at Paris. The force was supplied by the torrent of the Romanche (14 kilometers from Grenoble), and thence conveyed along a copper wire of 2 millimeters in diameter. The mechanical yield was about 60 per cent., and the utilized force 7-horse power. A part of this pumped some water employed to produce an artificial cascade. The remainder M. Deprez divided between all the machines of a small workshop, and lit besides 300 Edison lamps. On the occasion of the above experiments a banquet was given by the municipality in honor of M. Deprez."

We shall probably have some more scientific details of this matter before long.

A Valuable Electrical Discovery.

A valuable discovery in the department of electrical science was patented in Washington, June 13th, 1883. The invention is called "the combined telephonic and burglar system," and bids fair to provide the most adequate, certain, and cheap protector against burglars yet known. The system was first planned to make available for night use the telephone plant used in the daytime for telephone purposes, but which lay idle and useless during the night. The system as perfected, however, can be used either in combination with the telephone, district telegraph system, or with a separate system of wires and exchange.

The invention consists of a local closed circuit embracing the doors, windows, and all points of attack of the building sought to be protected, adapted to be thrown at will into or out of the main circuit, which contains the police station and exchange. During the day the main circuit can be used for telephone or other purposes. When the building is closed for the night, the local circuit is switched into the main circuit by means of an ingeniously-devised switch, and if the local circuit is in working order an automatic gong near the switch sounds. If the wire has been cut or the local circuit is open anywhere, the gong will not sound. When the circuit is in working order, the breaking of the circuit by opening a door, or window, or

FIG. 3.

the cutting of a wire in preparation for an attack, will sound the alarm at the central or exchange station, and also in the building of the subscriber, thus alarming the subscriber and at the same time indicating at the exchange the point of attack, enabling them to telephone to the nearest police station, or to send them over watchmen

When used in connection with the telephone exchange, the inventors have provided an auxiliary tag and attachments, to be attached to the ordinary drop tag of the exchange, and working with it, which, when the local alarm circuit is not switched in, falls with the primary tag, but when the alarm circuit is switched in, remains in position while the primary tag falls down, and remains down as long as the alarm circuit is switched in. When the local alarm circuit is broken, the auxiliary tag falls and strikes an annunciator, which rings an alarm bell in the central station until the tag is replaced. This system will do away with the necessity of night watchmen in stores, buildings, or manufactories, and is far more certain and reliable, as it cannot be bound or bribed.

The New York system of safe protection can be used with this alarm, as also the Day fire-alarm button, by simply changing them from an open to a closed circuit. The patentees are William Kline, of Toledo, O., superintendent of the telegraph system of the Lake Shore and Michigan Southern Railway; W. S. Shoupe, of Elyria, O., and Theodore Buskirk, of Toledo, O.

The plan of using the electric light in lighthouses has been carried out in a new lighthouse at South Head, on the English coast, with the happiest results. The light is of the first order and a revolving white light, showing a flash of eight seconds in every minute. The lamp is constructed so that gas, electricity or oil can be used. On all sides testimony is being borne to the remarkable power of the electric light, its reflection having been seen at a distance of sixty miles.

The Brush Electric Light Company of Cleveland, Ohio, has added a new branch to its extensive manufactory, to be devoted to secondary batteries. The building to be used for this industry cost $75,000. As great strength was required to sustain the massive loads to which it would be subjected, the walls and floors are of unusual proportions, so that hurtful vibrations will not be possible. The walls are twenty inches thick and their strength is increased by pilasters projecting eight inches. The floor timbers are 15-inch beams, on which are laid solid timber floors over seven inches thick.

San Francisco newspapers look forward with pleasure to the probability of the West coast being shortly placed in telegraphic communication with China and Japan. The *Alta* thus comments on the probabilities of the speculation proving a successful investment: "There are six transatlantic cables, and the new company, known as the American, British and Continental Cable Company, has made all the arrangements to lay two more. Each of the existing cables has cost about $5,000,000, but by recent improvements the cost has been reduced, and the new company expects to lay its cables for about $3,000,000 each. To lay a Pacific cable would probably cost about $8,000,000, but it ought to be a more profitable investment to lay one such cable than to multiply the number of lines across the Atlantic. Such a cable would do not only the business between this coast and the Asiatic and Australian countries, but also the vast telegraphic business of the merchants of the Eastern States with their correspondents in China, which now goes by way of the Red Sea. Nothing could do so much to increase the commerce of the port of San Francisco as cable connection with China and Japan."

It is stated that applications for patents for electrical inventions come in at the rate of from six to twenty a day, and that fifteen days fills a 500-page record of actions in electrical cases.

Chemical Applications of Electricity.

Among the electrical processes which encourage great hopes for the future, those which bear upon the industry of chemical products and the preparation of metals have been somewhat overlooked. It is well to remember that the dynamos, in the estimation of their inventor, were designed to take the place of batteries in galvanoplasty, before they were applied to the unexpected uses of lighting and of mechanical transmission. Industrial chemistry will undoubtedly draw advantages from the resources which are offered by the electric current. The last international electrical exhibition showed how to prepare metals chemically pure, to extract the precious metals from their salts or their alloys, to treat ores, and to form some special combinations for dyeing. While the French houses were spreading before our eyes the wonders of artistic galvanoplasty, Létrange published his researches upon the preparation of zinc, Wohlwill displayed a wonderful collection of metals deposited electrically, and Goppelsröder, with the modesty of a savant, presented specimens of colors obtained by electrolysis.

An Enterprising Electric Light Company.

THE AMERICAN ELECTRIC AND ILLUMINATING COMPANY PURCHASE THE PLANT OF THE ARNOUX COMPANY IN PORTLAND, ME.

Erecting new stations in Maine, Massachusetts, and Connecticut.—About to start in New York City with a one-thousand lights plant.—What an efficient president can do for an electrical company.—The success of the enterprises inaugurated by Mr. Edward H. Goff.—Paying a semi-annual dividend of $27,000.—What may be expected in the future.

As we are about to go to press, the news reaches us that the American Electric and Illuminating Company of Boston has purchased the franchises and business of the Arnoux Electric Lighting Company of Portland, Me.

Though we had no reason to expect this, it is by no means a surprise, and we shall be greatly mistaken if the people of Portland have not reason before long to congratulate themselves upon the entry into their city of the American Electric and Illuminating Company. The Thomson-Houston system, which will replace that formerly in use in Portland, is founded upon a correct interpretation of certain natural laws. The lights it generates are constant, economical, and efficient, and those who have once made use of them are loth to have any other.

The rapid progress now being made by the American Electric and Illuminating Company may be said to be due to two causes: 1st. The possession of an efficient light; and 2d, the means of intelligently introducing it. The strides made by this company in public favor and the means employed to start it upon the high road to success, will furnish interesting, and at the same time instructive reading, not only to those who are about to organize electric lighting companies, but also to those who, having mistaken the by-paths of temporary applause for the great highway of permanent success, are now witnessing the decline of the undertaking from which they had expected so much.

We have seen companies organized to introduce a really good light; but as the proper men were not employed to introduce it, little success was made.

Again, there have been got together executive boards of intelligent, pushing men; but a mistake having been made in the choice of a light, their labors, however untiring, proved of little avail, for the public is quick to decide between the relative efficiency of one electric light system compared with another, as it is about everything else; and though a convincing talker will do much in introducing a novelty, he cannot, when it is found to be of comparatively little value, find a demand in the same quarter for a new supply.

Let us look for a moment at the plan upon which the American Electric and Illuminating Company was organized, and the phenomenal success which has attended it from its very inception may be easily accounted for.

First and primarily, a superior light was obtained, and then competent men were placed in the management of the company's business. No promises were made that could not be fulfilled, and the plan of making haste slowly, which rarely commends itself to the unscrupulous, was firmly fixed upon. Thus, every step taken was a firm one; no position once attained was afterward found to be untenable, and thus little by little the confidence of the public was gained, and what was not long since but a tottering infant is now a robust and healthy adult.

To Mr. E. H. Goff belongs the credit of pushing the American Electric and Illuminating Company, of which he is president, into popular favor. Mr. Goff belongs to that unhappily small class of business men who never permit a desire to do business to lead them into exaggeration and folly; who never say what may not be corroborated, and who never encourage hopes that cannot be realized. Thus it is that they are always welcome in a place which they had once visited, and an atmosphere of stability and of permanency attaches to any enterprise with which they may be identified.

Only a few weeks since we had occasion to describe the lighting by electricity of Old Orchard Beach, a famous summer resort near Portland, Me. The system was that employed by the American Electric and Illuminating Company, and the plant was constructed for and distributed under the personal superintendence of Mr. Edward H. Goff.

A special train took a distinguished party, including the Governor of the State of Maine, to Old Orchard Beach, and upon their arrival they saw everything that had been promised. There was no delay, no hitch, no excuses, no blunders. Though the station (40x50) was hardly completed, so far as the exterior was concerned, Mr. Goff knew that the machinery and apparatus was in good working order.

We explain this much because we have known of a company inviting guests to witness an illumination and when the signal was given, the lights being improperly and slovenly arranged, did not respond and the company's officers had the mortification of having to acknowledge a failure where they had prophesied a grand success.

The antithesis of this was the case at the Old Orchard Beach exhibition. At the specified time Mr. Goff gave the signal and instantly the whole beach—one of the finest on the Atlantic coast—came out from utter darkness like a vision to the eyes of the astonished and delighted spectators. One hundred lights of uniform intensity pierced the gloom of night like miniature moons; every promise was fulfilled; every prediction came to pass.

This exhibition was indicative of the spirit of enterprise which pervades the management of the American Electric and Illuminating Company. In a State where a rival had long been established to thus suddenly spring into a prominent position in a single jump showed that the very acme of able management governed the destinies of the American Electric and Illuminating Company and so gained over the confidences of the public of that section as to warrant further undertakings. This was immediately recognized by Mr. Goff, and negotiations were begun looking to the purchase of all the rights, privileges of the Arnoux Electric Lighting Company, including the central station in Portland, with its engines, boilers, lines of poles, wire, structures, &c.

A meeting was held at the Falmouth Hotel, at which was present Edward H. Goff, President and General Manager of the American Electric and Illuminating Company; Silas Gurney, Vice-President, with Mr. Clarence Hale and George A. Thomas, of Portland, representing the American Company, and Messrs. Charles A Milliken, D. W. Coolidge and others representing the Arnoux Company.

The American Company obtained a charter some weeks ago for a new corporation in Portland under the name of the Consolidated Electric Light Company of Maine, which it controls. Under this charter the entire business in Maine will be conducted.

A 200-light station is to be established in Portland, and a 100-light station in Saco and Biddeford. Central stations are also to be constructed for Lewiston, Bath, Augusta and Bangor, besides in many of the smaller towns.

The new 100-light station which has been so successfully operated, and which attracted so much attention at Old Orchard during the present season, will be transferred to the new company.

The directorate of the new company is a strong one, and is a guarantee to the public that the company means business. It is as follows:

George A. Thomas, a retired capitalist of Portland, and brother of Hon. William W. Thomas, President Canal National Bank; Chas. A. Milliken, President Portland Rolling Mills; D. W. Coolidge, Hon. F. J. Rollins, Collector Internal Revenue; W. R. Wood, Director in the Merchants Bank; Hon. Clarence Hale, Elias Thomas, Payson Tucker, General Manager Maine Central and Eastern Railroad, all of Portland; Henry W. Staples, proprietor Old Orchard House, Old Orchard, Me.; Silas Gurney and Edward H. Goff, of Boston.

The new contract is considered as a very valuable one, as it really gives the American Company undisputed possession of the entire field.

The Thomson-Houston system will be substituted for the entire Arnoux business, and operations commenced at once. The company has leased commodious quarters in the Centennial Block in Exchange street, which is already opened for business.

But it is not alone in Maine that the American Electric and Illuminating Company is pushing its fortunes. By no means. In and about Boston its business has increased to such an extent that its officers were recently compelled to move their offices from No. 28 School street to new and commodious offices at 234 Devonshire street, Winthrop Square.

Those who remember how short a time this company has been organized as compared with many other electric lighting companies, will be surprised at the following, which is an official statement of its present scope and condition:

Plants in operation—Boston, 550 lights; Lowell, 150 lights; Fitchburg, 100 lights; Old Orchard, 100 lights, during summer. Cottage City, 50 lights, during summer. Hartford, 100 lights; Portland, 75 lights—replacing those of the Arnoux Company.

The additions about to be made are: Boston 100 to 150 lights; Hartford, 50 lights Lowell, 100 lights; Fitchburg, 50 lights; Portland, 100 to 150 lights, making it at the very least a 200-light station.

The factory of the American Electric and Illuminating Company, though now running at its fullest capacity, is by no means able to fill the orders that are coming in. A 200-light plant is now being constructed for Worcester, Mass. Two 100-horse power steel boilers are now being made by Allen & Sons, of Worcester, which it is expected will be completed and set up in about three weeks, and the station will doubtless be in running order by October 5th.

The company have contracted for ten additional stations for the distribution of the electric light of smaller magnitude, all of which will in all probability be finished before three or four months shall have gone. But this is not all. Mr. Goff, supported by his company, has determined to begin work in New York City at an early day. He proposes to erect a plant here of at least 1,000 lights capacity to be in running order by next winter.

Those incredulous persons, who have declared that the electric arc system of electric lighting, would do well to contemplate the results from the workings of the American Electric and Illuminating Company. These results show a success, in which the stockholders fully share, as is attested by the $27,000 of semi-annual dividends, which is now being distributed among them, and in which the common as well as the preferred stockholders participate.

The readers of the REVIEW will remember that it is but a short time since that a Boston journal made the somewhat remarkable discovery that the electric light, regarded from an economical standpoint, was a failure, a delusion and a snare. The afore-mentioned journal having now, as one might say, drawn in its horns, it would seem somewhat severe now, when it has possibly seen reason to change its mind, to thus call attention to its defective eyesight. If companies engaged in selling light at a loss can pay such a dividend as this, there will, in the future, be little trouble in encouraging capitalists to invest their money in their stock. The fact is, that the American Electric and Illuminating Company has adopted a system in which many improvements have been included. The operation of lighting a given district is no longer a matter of guess-work, so far as the cost is concerned. Mr. Goff has studied the subject so carefully that he can make a very close estimate beforehand in any given district.

In the Thomson-Houston system, which his company is employing, many of the errors in installation which obtained in the earlier and costlier systems have been discovered and corrected. Much of that loss of current before the lights were reached, which made these earlier systems so defective, has been stopped, and the uneconomical coupling of the steam engine to the dynamos has been greatly improved upon.

Again, if there was no money in electric lighting, how is it that the American Electric and Illuminating Company should extend their work in Maine, Connecticut and Massachusetts, and now contemplates erecting a station in New York City of at least one-thousand lights power? And this in the face of the fact that other and much longer established companies already have plants now at work in this city. If all this were proposed by a novice, the most natural supposition would be that he was deceiving himself. But here we have a practical business man, who has made the most encouraging success in the same field in other parts, willing and anxious to make the attempt, and a great company, with large capital, standing ready to back him up.

All this means but one thing, and that is the American Electric and Illuminating Company has discovered a means of economically distributing electric illumination, and we wish them every success in their enterprising undertakings.

Incandescent electric lamps are used in the carriage lamps of Baron Rothschild of Vienna—storage batteries placed under the coachman's seat are said to be capable of carrying a charge of electricity sufficient to feed the lights for 100 hours.

Prof. Hughes states that while electricity may be generated by magnetism just as light and heat—as in the case of the sun—may be generated by gravitation; but electricity is not a form of magnetism, any more than heat or light is a form of gravity.

Experiments are being made, according to the *Polytechnische Notizblatt*, in Paris, with a new alloy having a white color, yet containing no nickel. It is said to be very strong and malleable. It is made of copper and ferro-manganese, the proportions being varied according to the purpose to which the alloy is to be employed. A plate of the first-named alloy, two inches thick, was found by experiment to offer more resistance to a cannon ball than a steel armor plate of the same thickness.

French Statistics of Industry.

The following statistics as to the number of men employed in various branches of activity are published by the Minister of Commerce in France: Three hundred and forty-two coal mines, employing 106,415 hands; 1,036 turf cutting works, employing 27,977 hands; 355 iron mines, employing 8,468 hands; sixty other metallurgical mines, employing 4,422 hands; and 359 iron works, employing 57,000 hands. There are 412 establishments employed in the manufacture of china and pottery, employing 18,708 hands; 162 of glass and crystal, employing 23,421 hands; 536 of paper and cards, employing 32,653 hands. There are 619 gas works, employing 10,575 hands; 157 candle works, employing 3,603 hands; 339 soap factories, employing 3,509 hands; 512 sugar factories, employing 63,526 hands; and 5,024 textile works, employing 353,383 hands.

In the patent interference case of Weston against Sawyer and Man, of New York, involving priority of invention for improvement in the art of manufacturing carbon conductors for incandescent lamps, the Examiner of Interferences has rendered a decision awarding priority of inv to Weston.

If you wish to make a man perfectly miserable send him an important message by telephone. Tell him to be sure to meet you at a hotel at a certain hour, say. But when he asks you who you are, don't understand him and don't give him your name. He'll fret off a pound of flesh an hour trying to make out who it is that has telephoned him.

Recent Improvements in Galvanic Batteries.

The progress of invention in connection with electric batteries is apparently moving at a very slow rate at present, and so far no one has yet invented a battery which will enable us to light our rooms as cheaply as by gas or paraffin lamps.

Among recent patents we notice one granted to Mr. G. G. André for an invention in which carbon, in the form of highly burnt coke or wood charcoal, and in the shape of small pieces, is used, being separated from direct contact with the exciting liquid by an absorbent diaphragm. Salts of potassium, sodium or ammonium are used as the electrolyte. The zinc or iron electrodes are made in the form of tubes, and rest on wooden blocks surrounded by a tubular diaphragm, which allows the liquid to penetrate to the pieces of carbon in which the zinc or iron cells are imbedded.

In another form the patentee coils long strips of copper and zinc on a boss of wood and separates them by intervening pieces of india-rubber. The wheel or disc thus formed is revolved by an electro-motor, so that the exciting fluid does not cover more than half the disc at any one moment.

Another device, which, however, went no further than the stage of provisional protection, is the invention of Mr. L Hartmann, and is thus described:

"I employ as the exciting liquid caustic potash or caustic soda in solution, and for the positive electrode I use zinc, while for the negative electrode I employ either iron, copper, nickel, cobalt, silver or gold. By preference I employ silver or iron in the form of network, alone or in combination with fragments, or of fragments alone, although network is preferable, or I use any body, organic or inorganic, also in the form of network coated with silver by the electrolytical process.

I construct the outer cell of a flat shape, like a shallow pan or a plate. Upon the bottom of this I place the zinc, by preference, in the form of strips, either coiled spirally or otherwise arranged so as to offer considerable surface. Upon the zinc I place a porous diaphragm of earthenware, textile fabric or other suitable material, so arranged as to entirely separate the lower part containing the zinc from the upper part containing the negative plate, and upon this diaphragm is placed the negative electrode, formed by preference of a network of silver or iron, or any other form may be used presenting considerable surface and which is immersed in or merely damped by contact with the exciting liquid in which the zinc is immersed."

A more important device which has been fully patented by Mr. J. Rapieff, consists of improved elements and of improved arrangements. Thus he proposes to increase the surfaces of carbon electrodes by preparing them from comparatively thin sheets of carbonized and suitably treated organic substances, such as cellulose, perforated or grooved or bent into zig-zag, spiral, cylindrical or other forms. For the same purpose he uses rows or groups of comparatively thin pencils or rods of carbon, such as gas retort carbon, coke or electric light carbon, or any other kind of carbon. These rods or pencils can be put close together or separate with a space between them, all being, of course, united or metallically bound together so as to make one pole. For the same purposes he uses carbonized organic fibrous substances, such as wood or cotton, flax or hemp or threads or strands twisted or not, together or separate, or tulle, tarletan, muslin, canvas, net, linen and other fibrous woven or textile materials. These materials may be used separately or combined with those above mentioned, and in the form of thin rods, sheets, ribbons, threads or any other suitable form, and grooved or perforated as may be desired.

To give to all these substances more strength, elasticity, rigidity and more particularly electrical conductivity, the patentee carbonizes them under necessary pressure and at proper temperatures in closed vessels in presence of a carboniferous or hydrocarbonic atmosphere at suitable pressure or in presence of liquid or solid bodies of the same substance or in presence of a current of the same, so as to obtain upon them a deposit of the particles or granules of crystalline metallic or graphitoidal carbon. To increase the conductivity they may also be covered with thin layers of one or more metals, such as platinum, palladium, lead, iridium, silver, &c.

The principal aim of these arrangements is to obtain electrodes having a large surface, every part of which is thoroughly connected with the pole of the battery. By virtue of such arrangement we obtain at once a decrease of the local action and reduction of the force of polarization of the electrodes; their connection with the liquid or solid depolarizing agent is increased and more intimate, and consequently the quantity of the current given by the battery is increased. In the new forms of improved cells which the patentee proposes to construct, he takes lead or other metal for one electrode, solid or perforated, bent or straight, grooved or not, in form of one or more sheets, rods, gauze, ribbons, or formed into a vessel. Peroxide or oxide of lead, barium, manganese, silver, iron, copper, or their equivalent, separately or combined or mixed with small pieces, residuums or cuttings of lead, shot, powdered or granulated lead, or other metal of which the electrode is made, or carbon or graphite, are placed around the above-mentioned electrode in a porous vessel, which may afterward be closed or sealed, leaving apertures for the escape of the gas and the charging and discharging of the cell.

This porous vessel he put into another vessel of larger size, which may be sealed in similar manner afterward, and into which he also puts another electrode made of zinc, or the large vessel may itself be made of zinc. As active liquid or liquids for the charging of this cell he proposes to use a solution of the salts or hydrates or oxides of zinc ammonia, potassium, sodium or other alkaline metals, or a solution of an acid separately or together with the above-mentioned solution. The same liquids may be used in both cells or vessels.

In this case he prefers to use solutions of hydrates of oxides or hydro-oxides of sodium, potassium or other alkaline metal or solutions of sulphuric, hydrochloric, oxalic, chromic or other acids, or particularly for the battery with peroxides or oxides of lead, iron, silver or copper, a solution of salts, such as chloride, chlorate, permanganate, sulphate, nitrate, carbonate of ammonia, sodium, potassium or magnesium. Or the said battery may be used as a double liquid battery. Then for negative cell or vessel—where there is electrode of carbon, lead or other metal with peroxides or oxides of lead, iron, copper, silver and not manganese as depolarizing agents—he uses a rather strong solution, say about 15 to 30 per cent. of sulphuric, hydrochloric, chromic or other acids, and in the other or positive vessel or cell (where the zinc is) a solution of one or several of the salts of ammonia, sodium, potassium, magnesium or other alkaline metal, or a solution of sulphate of zinc Also as an active liquid in the negative cell with the said substances, including oxides and peroxides of manganese, a solution of hyd'o-oxides of ammonia or alkaline metals.

With reference to the new oxide of copper battery of Messrs. Lalande and Chaperon, M. Hospitalier gives the following account of a trial made with a cell weighing 1,914 grammes and containing 200 grammes of oxide of copper and 800 grammes of commercial solution of potash at 40 per cent.:

The E. M. F. one hour after sitting up was 0.98 volt, and the cell was put in circuit for six whole days through a resistance of 0.8 ohm. The current supplied was on an average ½ ampere during six days or 518,400 seconds. The total quantity of electricity supplied was 259,000 coulombs, the weight of zinc consumed 88 grammes, which corresponds to a theoretical production of 260,000 coulombs.

This, says M. Hospitalier, is a most important point, and very favorable to Lalande and Chaperon's battery, for it shows that the local action is practically *nil*. The energy that the batter is capable of supplying is, therefore, available at will, without it being necessary to disturb the elements in order to withdraw the zinc from the liquid, as in the bichromate of potash batteries, for example. The useful available rendering is 0.02 kilogrammeters per second.

In six days, therefore, the battery supplied 10,368 kilogrammeters of available electrical energy. This exceeds the results obtained up to the present with accumulators of the same weight; but we must add that the supply is much slower than these latter. It is, however, easy to increase this rendering by increasing the surface of the elements and by diminishing the distance of the oxide from the zinc plate. The result then increases more rapidly than the weight, and tends to approach that of the accumulators The remarkable constancy of the rendering must be attributed chiefly to the fact that the product of the reduction is metallic copper, which is a good conductor, and that the solution of an alkaline salt of zinc which is formed presents a conductivity almost equal to that of the solution of potash. For a given weight of zinc dissolved, about three times the quantity of solid potash is required and a quantity of oxide of copper, equal to 1 25 times the weight of the zinc.

Covering Metal with Glass.

An exchange gives the following process for applying a glaze or enamel to metals: A mixture of 20 parts of carbonate of soda, 11 of boracic acid, and 125 of broken (flint) glass is melted and the mass poured out on a stone or plate of metal. When cold, it is pulverized and mixed with a silicate of soda (water glass) solution of 50° B. The metal is covered with this paste, and then heated in a muffle until it melts. This enamel is said to adhere well to iron and steel.

Relation of Electromotive Force to Velocity of Rotation.

In his recent lectures at the College of France, Maurice Levy has given equations which rigorously define the electric field and the magnetic field of a dynamo-electric machine in its permanent state. Although the equations cannot be integrated, he has deduced many consequences, among which he calls especial attention to the following: The electromotive force of a dynamo-electric machine is not, as has been commonly thought, proportional to the velocity of its coils; it can only be expressed by an infinite series, arranged according to the integral powers of that quantity.

Light Motors.

In an excellent article which appeared in a late number of the *Aéronaut*, David Napoli, President of the Société de Navigation Aérienne, examines the comparative desirability of steam and electric motors for propelling long balloons. He found that a twenty-horse steam engine, working for ten hours, would consume 200 kilogrammes of coal and 1,400 kilogrammes of water. An electric engine of twenty horse-power, with all its supplies for ten hours' service, would weigh about 1,400 kilogrammes, which is less than the bare consumption of material in the steam engine, leaving out of the question the weight of the generator and of the mechanism of transmission.

The Berlin Opera House.

The London *Electrician* says: "This Opera House was recently re-opened, after having been somewhat improved as to its internal arrangements. Amongst other things, the *foyer* has been lighted by means of electric lights, the result of which has been to considerably reduce its temperature as compared with that experienced before the introduction of the electric light, and also to make it a comparative icehouse as compared with the auditorium of the Opera House. The correspondent of a daily paper, describing the opening night, says: 'I saw not a few ladies hastily wrap themselves up in cloaks, and some incontinently retire from the dangerous though grateful coolness of the *foyer*.' The next best thing for the authorities to do is to light the whole building by the new system."

Spectra of Carbon Compounds.

Herr K. Wesendonck describes the spectra produced by electrical discharges through the rarefied vapors of compounds of carbon and hydrogen, or of these combined with nitrogen and oxygen. Herr Wesendonck considers he has proved that the spark spectrum of bands described by Mr. Swan is due to carbon itself separated from its compounds in a sufficient quantity and at a sufficiently high temperature, for which it is necessary that a comparatively large quantity of electricity shall pass each unit of section in the unit of time. On the other hand, the channelled spectrum (called by Watts the second) must be ascribed to oxide of carbon.

Electric Light on the Fulton Ferry.

ADVANTAGES OF THE LIGHT—BRILLIANCY OF THE FULTON WHEN LIGHTED UP—OPINIONS OF FERRY PASSENGERS.

The ferryboat Farragut of the Union Ferry Company, says the Brooklyn *Union* of Aug. 4, was last evening lighted with the new gas arrangement.

Formerly there were brackets along one side of the cabins of this boat, the number of lights in each cabin being 10. Instead of the brackets there are now four handsome bronze chandeliers suspended from the ceiling of each cabin.

The two chandeliers in the large compartment have four burners each, and the two in the small compartment three burners each, so that in each cabin there are four more lights than under the old arrangement.

Notwithstanding these additional lights and the new position of the burners, the gas falls very far short of the electric light with which the Fulton was recently supplied. These changes are the result of the appointment of a committee of the directors a few weeks ago who were charged with the duty of seeing what improvements could be made in the lighting of the company's fleet. The electric light was placed on the Fulton by the United States Illuminating Company about a month ago, and it has been running very successfully ever since.

The public are delighted with it and hope that the company will have it on all their boats.

The dynamo is run by an engine of 20-horse power placed below deck alongside of the great engine, the whole arrangement occupying about 25 feet of the boat's length.

The number of lights on the boat is as follows:

	LIGHTS.
In ladies' cabin	16
In gentlemen's cabin	16
At each end of center-house	2 4
In lantern on top of each pilot-house.	2 4
At each side of the pilot-houses.	1 4
On top of flag-pole	1
Inside the center-house	2
Below deck	6
Total	53

At present it has not been found necessary to use more than one light at each end of the center-house and on the top and sides of the pilot-houses. In case of fog they would be all on.

It cost something under $3,000 to place the light on the Fulton, including, of course, the engine and dynamo. The illuminating company undertook to run the light at their own expense for thirty days, including an engineer, the ferry company supplying the steam from their own boiler.

With regard to the refitting of the Farragut with gas, the cost was small compared with the placing of the electric light on the Fulton, as the old gas holder was made to serve. The gas holders on all the boats are away from the boilers at the opposite end of the boat. It would, however, be much safer if they were placed somewhere on the top of the boats in-

stead of below deck. The holders are of iron 7½ feet in diameter and about 8 feet in height, including the rubber top, which is weighted and forces the gas over the boat. Each holder will contain about 350 cubic feet. Gas has to be taken in from the main in the ferry-house several times during the night. The Farragut took in a supply six or seven times last night and used about 2,500 feet. This, of course, is a great deal more than was consumed on the Farragut previous to the additional burners being placed in her cabins.

Our reporter made several trips last evening on the Fulton and Farragut and ascertained the facts above given, but was unable satisfactorily to get at the comparative cost of the two lights. It was thought, however, if the regular engineer of the boat could look after the electric light engine and dynamo as well as his own engine the electric light would be cheaper and be much less trouble, as the taking in of gas several times in the night would be dispensed with, and there would be no danger of a gas explosion.

The reporter spoke with several gentlemen on the Fulton as to the electric light, and there was but one opinion regarding it, and that was, that the company should have it on all their boats. "There are several reasons," said one gentleman, "why it should be introduced: First, because there is no danger from explosion, as there is with gas; next, because one can sit in any part of the cabin and read; next, because in thick weather the chances of collision are very much lessened, the electric lights aloft and at the ends of the boat being seen much further than gas. I know that the public appreciate the introduction of the light on this boat. There are many men returning to Brooklyn in the evening from business who buy the Brooklyn papers at the ferry. They, like myself, like to know just as soon as they can what has been going on in the city during the day, and they avail themselves of the five or six minutes in crossing the river to glance over the headings. I was reading the article in the *Union* on gambling at Coney Island just as you spoke to me. If I had been on one of the dim gas-lighted boats I must have kept the paper in my pocket till I reached home, because of the poor light, while with this light I can sit at the remotest corner of the cabin and read with perfect comfort."

Another gentleman said: "The Union Ferry people are rich enough and should be enterprising enough to give us the electric light on every boat. Gas is out of date. The electric light is as far ahead of gas as gas is of oil. The Jersey City boats are now lighted with the electric light and I understand the owners are well satisfied with it. The Brooklyn boats should be as well lighted as the Jersey City boats. The trouble with the Union Ferry Company is, it is too conservative, and besides, as I understand, there is a strong gas element in the Board of Directors. I mean that some of the directors are interested in the gas companies and don't want the electric light. Probably it would cost somewhat more to run the electric light than it does to run gas, but the Union Ferry Company could pay a fine dividend and roll up a large surplus even then. The Ferry Company must not lose tight of the fact that they have the Bridge to compete against now and must do everything they can to make the boats attractive. The Bridge cars will shortly be running, and they will be well lighted and very comfortable, and the Bridge itself is brilliant at night."

On the Farragut, a gentleman said: "I just missed the Fulton. I always try to catch her, as she is finely lighted. The electric light beats everything. Gas is rapidly going down before it. All large buildings, the main streets and the ferryboats should be lighted with the electric light. The Union Ferry people ought to put the electric light on all their boats at once, but here on this boat (Farragut) they have just been rearranging the gas, and what does it amount to—a miserable light at the best. And, besides, I don't like the idea of a great gas tank under my feet. I have never been down below to see where it is located, but it cannot be far from the fires, anyhow. It seems to me that a gas tank should be on the top of a boat and not under the deck. I read in the *Union* the other day that the ferry directors were undecided as to whether they should go on putting the electric light into all their boats or rearrange the present gas fixings. If they decide on the latter, it will be so much money thrown away, as the people who cross the ferries will demand the electric light."

Inquiry was made at the ferry office to-day when the directors would meet to decide about the lighting of the boats. The answer received was that a good many of the directors were out of town—some of the committee who have the lighting arrangements in charge among them—and till they returned nothing definite would be done.

The Government Telegraph.

The question, "Ought the National Government buy and control the telegraph?" has been addressed to a number of prominent men of the country by the Erie *Dispatch*. George F. Edmunds, President *pro tem* of the United States Senate, replies that the government has long since seen the necessity of a telegraph service in connection with the Postoffice Department and there is a strong probability that Congress at an early date will take action in the matter. John Campbell, head of the Telegraphic Brotherhood, answers that he can see no benefit to be derived by the operators from the change if they are not assured of just wages. Governor Butler, of Massachusetts, wants the government to control the telegraph, but not to buy any telegraph plant now in existence. Ex-Senator David Davis, through his private secretary, says that, under certain restrictions, the government should control the telegraph as it does the mails. Editor Henry Watterson is afraid that to place the commercial transactions and the telegraphic news in the hands of a party in power would be, particularly in case of war, a dangerous experiment. He inclines to a less sweeping measure than absolute purchase and control. Congressman John A. Kasson, of Iowa, thinks that under a government telegraph system, administered as is the Postoffice Department under the Republicans, the operator would be well treated, and a strike avoided. Ex-Governor Cornell, of New York, who holds Western Union stock, regards as communistic the cry to give the government control of the telegraph. Ex-Speaker Randall thinks that the government has already sufficient power in its hands. The adding of 25,000 additional employes to the government service for spoilsmen to quarrel over would, he says, be a step in the wrong direction. Inventor Edison's reply to the question of the *Dispatch* is "No."

The Commercial Telegram Company has placed a number of its telegraphic printing instruments in the offices of stock brokers, and they are being used by one of the news agencies to distribute its matter. The Gold and Stock Telegraph Company asserts that these new instruments are an infringement upon its patents, and some time ago began suits against the Commercial Company on that ground. As soon as one of the new instruments is placed in a broker's office he receives a letter from the Gold and Stock Company setting forth that the machine is an infringement upon its patents, that the company has begun the suits alluded to, and that those who use the machines are also infringers, and that the company will ask the courts to grant it such relief from the users as may be proper. The letter concludes by saying that "the annoyance incidant to legal redress may be avoided" if a satisfactory disposition of the matter could be made by a personal interview, which is suggested. In reply to this letter the Commercial Telegraph Company has sent a letter to the news agents using its instruments, and the latter have distributed copies of it to their patrons. In this letter it is denied that its instruments infringe upon the patents of the Gold and Stock Company, and promised that the company will defend any suits that may be brought against individuals for using its machines. The Gold and Stock Company has a news agency under its wing.

The New Telegraph Company.

The expected conference relative to the proposed new telegraph company was not held in this city yesterday owing to the non-arrival of Mr. Eugene J. O'Connor from Boston. Mr. John Campbell, master workman of the Telegraphers' Brotherhood, is now in the city, and he discussed the new project with Master Workman John Mitchell, Editor Taltaval, and other members of the telegraphic fraternity. Mr. Campbell has great confidence in the prospects of the proposed company. He says that a large number of the most skillful telegraphers in the country are interested in the scheme, and they will not only contribute their abilities, time and labor to the enterprise, but also many very valuable patents in telegraphy which they own and control. Mr. O'Connor is supposed to have some important information to impart to his telegraphic brethren here with regard to the extent of the financial stimulus that Boston men will give to the new company.

Telegraphs in Europe.

The following table gives, according to statistics published by the European Telegraph Bureau, the numbers and length of electric telegraph lines in the various countries of Europe, with the number of inhabitants to each office in the principal countries:

Country.	Number of Lines.	Total Length. Miles.	Inhabitants to each Office.
Germany	10,308	161,954	4,388
France	5,885	140,436	6,342
Russia	2,731	138,902	27,091
Great Britain	5,600	122,856	6,294
Austria	2,604	57,522	8,504
Italy	2,470	56,235	10,850
Hungary	1,069	34,083	
Spain	385	25,315	43,358
Sweden	788	18,565	5,794
Belgium	827	17,350	
Switzerland	1,139	10,040	
Norway	260	9,693	7,411
Holland	418	8,782	
Portugal	202	6,644	
Roumania	206	5,382	
Denmark	387	5,250	
Greece	100	2,867	
Servia	60	2,569	
Bulgaria	37	2,113	
Bosnia	69	1,976	
Luxemberg	64	395	

The Underground Conduits in Philadelphia.

The directors of the Philadelphia Sectional Underground Conduit Company perfected last week arrangements for putting one thousand men at work on the enterprise on Chestnut, Walnut, Third, Filbert and Tenth streets. A proposition to lay the Chestnut street conduit in the same trench with the large gas main to be constructed this Fall was not favorably considered by the board.

The Ostracized Female Operators.

A fund is being raised in behalf of the telegraphers engaged in the recent rising against the Western Union Company who have since been refused employment. An address issued by Mr. Tom O'Reilly, treasurer of the fund, states that aid is especially asked for the ostracized female operators, who, after their hearty encouragement when the men showed symptoms of yielding, have been persistently rejected when applying for their old situations. These ladies, however, have no desire to live in idleness, and ask those who sympathize with them to give them notice of any situations that can be obtained. Treasurer O'Reilly will be at Clarendon Hall between 2 and 4 P. M. daily to receive subscriptions and information that may be useful. He acknowledges several subscriptions for the female operators, including the following: *Herald* fund, $59.75; Thos. Edison, $50; Cigarmakers' Progressive Union, No. 1, $228.78; Cigarmakers, No. 2, New Haven, $50; United Piano-makers, $250; F. B. Thurber, $25; and others aggregating $108.65.

Telegraph Builders Pleased.

Richmond, Va., Sept. 6.—Much satisfaction is expressed in business circles here at the consolidation of the Southern Telegraph Company with the Bankers and Merchants' Telegraph Company, since it improves the prospect that the indebtedness of the former company will now be liquidated. It is said that the men who have been building the lines have not been paid for four months; that the company owes other officers considerable sums, and that their line material has been attached for freight and other bills. The gang of men employed on the lines between Charleston and Columbia repeat the same story of the operations on that railroad. It is believed that the new organization will see that these liabilities are discharged.

Death of an English Electrician.

London, September 5.—Professor Varley, who was electrician to the Electric International Telegraph Company, which laid the first cable across the Atlantic Ocean, is dead.

Electric Headlights.

It might have been supposed that one of the first applications of the electric light would have been for use in the headlight of locomotives. The present lights are notoriously inadequate, indeed, almost useless, while an electric headlight would render night travel as safe as that done by daylight. There are peculiar difficulties, however, in adapting any of the present methods of producing light by electricity to use one locomotives. The jarring and shaking to which they are constantly subjected would be fatal to any of the forms in use for lighting buildings on account of their delicacy. It is not easy to apply the power of the engine to the production of the electricity, for that does not keep constantly in motion.

The vexed problem has at last been solved, however, it is stated, by some Austrian experimenters who have produced a machine that works with complete success, and lights the track for a mile ahead as plain as daylight.

There is no doubt that if this report is not true, the problem will be solved by some one else. Electric headlights will be in general use before the twentieth century begins.—*Ex.*

Tubes and Wires Underground.

The pipes for the pneumatic tube service of the Western Union Telegraph Company are being laid between the building of the company at Broadway and Dey street, and the new building at Fifth avenue and Twenty-third street. Four brass tubes, each 3 inches in diameter will be put down. In the same trench will be laid two 5-inch iron pipes for holding telegraph wires to be used in local business. The company now has 75 miles of wire underground between the main building and the Stock and Cotton Exchanges and the North River cables. The pipes are laid four feet underground to be out of the reach of the frost. The pneumatic tubes will be in operation early in the winter. Pneumatic tubes now run to the newspaper offices, the Stock and Cotton Exchanges, the Equitable Building, and the cable offices. The new Produce Building will be connected with the main office in the same way.

Suit Against a Cable Company.

Philadelphia, Sept. 8, 1883.

A suit has been begun in the Court of Common Pleas No. 2 by the Western Union Telegraph Company against the Manly Telegraph Cable Company for the recovery of $2,000 advanced to the latter company in November, 1880, as a preliminary payment upon a contract for the laying of three cables in Chestnut street, between Third and Tenth streets. The work was never done, and the company subsequently became insolvent.

Telephonic.

Detroit and Its Telephones.

Editor Electrical Review:

Detroit is unquestionably one of the handsomest cities of the United States.

The name indicates the location "of the straits," and is obviously an abbreviation for "The City of the Strait." Instead of being a strait, however, the water on the bank of which Detroit lies is a river wide and deep, and by it after passing through the St. Clair River, and Lake St. Clair, the waters of the upper lakes, Superior, Michigan and Huron, are conducted to Lake Erie, thence to the Falls of Niagara, to Lake Ontario and out to the Atlantic ocean.

The Detroit River is forty feet deep, upwards of three-quarters of a mile wide, and its waters are eminently clear, and of a bluish green color. The principal thoroughfares of the city, Jefferson and Woodward avenues, are each 120 feet wide, and I don't dare to say how many miles long, and are respectively the strongholds of the wholesale and retail trade of Detroit. I have seen retail stores on Woodward avenue rivaling anything in New York, Boston or Philadelphia.

Both avenues are brilliantly and profusely illuminated with the Brush Electric Light, which has not long been introduced. The United States and Hackhausen electric light companies are also about to be introduced into Detroit. In addition to the great avenues referred to there are three other important thoroughfares, which after traversing the city, extend out into the State, forming the high roads to several important points, Michigan avenue constituting the main road to Chicago, Grand River avenue stretching across the State of Michigan to Grand Rapids and Grand Haven, and Gratiot avenue extending to Port Huron and Fort Gratiot, at the head of the St. Clair River.

The method in which the streets of Detroit are laid out is peculiar, and preferable, in the humble opinion of the writer, to the rectangular monotony and the chess-board regularity of streets and avenues crossing one another transversely, in the manner of the average American city. About eight squares from the river Woodward avenue opens out into and crosses a magnificent open space called the Campus Martius, on which fronts the City Hall, while the center is occupied by a large and beautiful soldiers' monument. A number of other streets and avenues radiate from the Campus Martius and ramify in all directions.

Still a few squares further on, Woodward avenue reaches what is called the Grand Circus. This is a semi-circular park, which formed the center of the city at one time. From the Grand Circus also, various streets and avenues stretch in different directions, both transversely and diagonally, while still another set of streets cross these in circles concentric with the Grand Circus. This expedient has the result of shortening the blocks, and making a number short cuts, or shunt circuits as it were, by which the resistance to the current of locomotion is materially diminished.

Just over the Detroit River is the Canadian town of Windsor, which on a cursory inspection appeared to consist principally of a river bank, a big new hotel, considerable waste land bringing forth a bountiful crop of thistles, and wooden sidewalks.

The Western Union Telegraph office at Detroit occupies a building on the corner of Griswold and Congress streets, and the American District Telegraph office is located in the basement of the same building, although it is the property of the "Telephone and Telegraph Construction Company."

The telephonic exchange interests of the State of Michigan are owned by the latter company, and the connecting and extra territorial lines between exchanges are owned by a separate though identically officered corporation called "The Michigan Bell Telephone Company."

The combination or consolidation of these two companies constitute a third concern called "The Michigan Telephone Company," although for certain specific purposes the organization of the constituent companies is maintained.

The Michigan companies are officered as follows:

James McMillan, President.
D. H Louderback, Vice-President.
Hugh McMillan, Secretary and Treasurer.
W. A. Jackson, General Manager.
Geo. A. McKinloch, Auditor.

The Telephone and Telegraph Construction Company started the Detroit exchange in the autumn of 1878. At the present time it has fifty-seven exchanges doing business and prospering in the State, the principal ones in addition to Detroit being Grand Rapids, East Saginaw, Jackson, Bay City, Port Huron, and Muskegon.

From the Detroit exchange nine aerial cables extend, their average length being 250 feet, one of them has a length of 849 feet. One of these cables, the long one, was made by the Western Electric Company, three by the Day Kerite Company, three by E. F. Phillips of Providence, R. I., and two are home-made. The number of conductors in all but the Kerite cables is fifty, the Kerites thirty-six.

The outside construction in Detroit is very fine, the majority of the lines being strung on poles. Some of the finest pole lines in the United States are here to be found. The linewire is nearly all No. 12 E. BB.

1400 subscribers have so far crowned the efforts of Manager Jackson and his assistants, all of which are provided with magneto bells. In most cases there is but one subscriber per circuit.

Fifteen extra territorial lines leave the Detroit exchange, and fifty-three towns and cities are constantly in direct communication, while no less than one hundred and five can be reached by means of intermediate switches. This is a branch of telephonic enterprise in which Michigan has ever taken the lead.

The telephone controls also a manufacturing establishment in Detroit, "The Detroit Electrical Works," and here the majority of the magneto bells and switchboards used in Michigan are made.

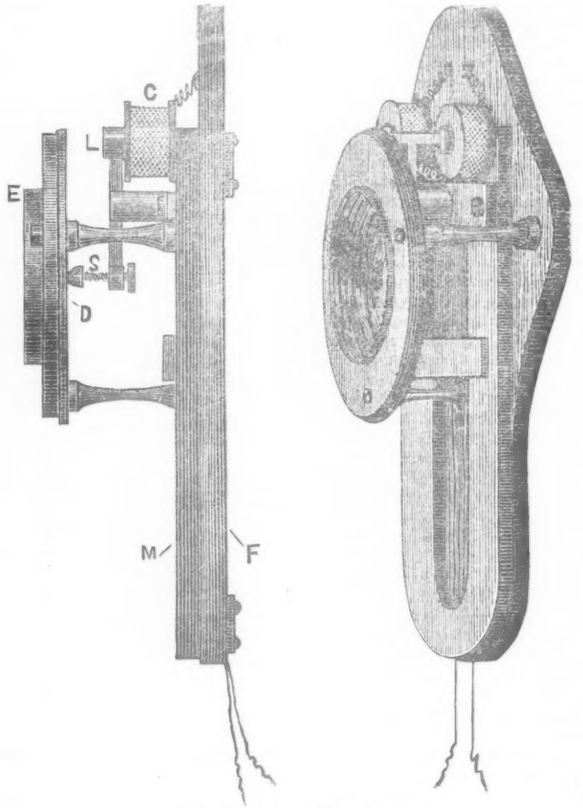
Some bells are, however, to be found in Detroit which are the product of other manufacturers.

In the central office there are now twenty-two switchboard sections of fifty lines each, all of which were made in Detroit.

These are of the cross-bar pattern and are worked on the grouping principle.

Among these is a remarkable double switch, operated by two operators one on each side of the switch. But one set of talking bars are used, but the incoming line just before reaching the switchboard bifurcates, one branch passing through an annunciator and then down a vertical line bar to the ground plate; while the other branch similarly passes through an annunciator and down the other side, but is normally open.

All incoming calls are received and attended to by the operator on the grounded side, while all calls from other boards for subscribers on this, are connected on the open side, the operator there having the power of taking the ground connection off. Each side at once knows whether the line is in use on the other side by the position of the ground button.



THE "HAMMER" TELEPHONE.

Twenty-seven female operators and six male operators, *i.e.*, four during the night and six in the daytime are employed here, all of whom, with the addition of a check boy, are under the immediate superintendence of Mr. James F. Land, chief operator.

Each switchboard has telephonic communication with every other board, the fall of the annunciator drop being adopted to open the original circuit and close a new one through the telephone.

Mr. Land is chief operator, and has been with the company since its inception, as has also Mr. McKinlock, the auditor.

In charge of the entire construction, maintenance and operating department, is Mr. E. F. Phillips, formerly a well-known Morse operator.

Mr. Jackson, the general manager of the company, was also at the time of the notorious sliding scale reduction of salaries in 1875, a Morse telegraph man, being chief operator at the Detroit office. He resigned at that time, but still lives, as the Michigan Telephone Company bears witness.

JACKSON, MICHIGAN,

has a lively little exchange of about one hundred and ninety subscribers, whose lines are connected with four fifty line switchboard sections.

Even this office has four out-of-town lines, connecting with twelve other towns direct, and with a multitude of places more or less directly.

While at Jackson, the writer conversed with Flint, Mich., a distance by wire of one hundred and sixty miles.

Mr. W. L. Burrows is the manager of this exchange, and is evidently the right man in the right place. T. D. L.

The "Hammer" Telephone of M. De Locht-Labye.

The London *Electrical Review* says: This telephone constitutes, it is claimed, quite a new and original arrangement for transmitting speech. It has been, up to the present, almost universally supposed that for the telephonic reproduction of speech the employment of continuous undulatory currents is indispensable. Professor Bell is looked upon as the originator of this theory, and his great influence in the scientific world, and especially his invention of the telephone with stretched membrane or flexible disc as an application of this theory, supported him, and for the time silenced all contradiction.

It is claimed for the De Locht-Labye telephone that it has no flexible organ, no part susceptible of the undulatory movements, which are, as Bell said, the reproduction or fac-simile of the sound waves of the air.

We will explain, in a few words, the construction of the receiving apparatus, which we have shown in perspective and in side elevation in the accompanying sketch. A horseshoe magnet, *M*, has at its poles two little cores of soft iron, on which are placed coils *C*, of insulated copper wire. This magnet is fixed immovably to a wooden frame, *F*, which serves as a support to the whole apparatus. In front of the poles of the magnet, and at a very little distance from them, although this distance can very easily be regulated, as we shall soon see, is an armature, consisting of a thick inflexible bar of iron. This bar forms part of a fixed lever, *L*, moving freely on a fixed axle, placed on a little rod of copper, brass, or any other material. As we see, by its position, the armature lever is thus apparently a free reed, and is, in itself, in no way of the nature of a flexible disc. It is only fixed to the support by its axle, and is not connected with any membrane or other organ. It is terminated by a little hammer of metal, or some other substance, fixed to the extremity of a regulating screw, *S*. This hammer, in its normal position, rests upon a thick, rigid, inflexible piece of wood, glass, ebonite, or any other material, *D*, of any shape whatever, but which, for the sake of symmetry, has been made cylindrical in the apparatus, and to which is fitted an ear-piece, *E*. We must observe that, as the inventor, who is now in London, has shown us, the ear-piece may form the part which supports the hammer, which shows, he thinks, that in no way is it of the nature of a membrane or flexible disc. The position of the armature lever is determined by the magnetic attraction of the poles of the magnet, the effect of which is counterbalanced by the reaction of the fixed portion supporting the hammer which terminates the lever. By the help of the screw which carries this hammer, we can easily regulate the distance between the poles of the magnet and the armature, so as to obtain the maximum telephonic effect.

These are the essential characteristics of the De Locht-Labye telephone.

Bell, in his original specification (Morgan-Brown patent, June 9, 1877), made the following statement:

"In all previous systems of telegraphy, messages have been received either by means of chemical changes produced by the action of the electrical current, as in the various forms of automatic and autographical telegraphs, or by means of the mechanical movement of a portion of the receiving instrument, operating to produce a visible signal, as in needle telegraphs, a mark upon paper,

or other material, as in printing telegraphs, or a sound, as in the Morse system."

He immediately adds:

"Upon these and all other plans it has been found difficult, if not impossible, to distinguish between more than four messages transmitted simultaneously over the same circuit, two in each direction;" and as Mr. Webster, Q. C., for the United Telephone Company (Limited), said, in his pleading:

"In no single case could it be pretended that Professor Bell intended his instrument to act as reeds." Now, in the De Locht-Labye telephone, it is claimed that the armature is a free reed. It is arranged in a manner that reminds one of the armature of the Morse telegraph, or, better still, of that of the Hughes printing telegraph, and, nevertheless, the transmission of sounds of all kinds and of speech is effected with complete success.

Numerous experiments have been made by experts with the instrument, of which we give a sketch, and it is declared unanimously that it works at least as well as the Bell telephone, as regards clearness and loudness of sound.

The inventor is convinced that he can make his instruments effect far more, and that, consequently, his results will considerably exceed those of the Bell telephone, so that his telephone can be employed for very long distances.

Thus, in order to show the essential points of difference between the De Locht-Labye and Bell telephones, from a mechanical point of view, one might say: That the Bell telephone is characterized by the combination of a magnet, provided with a coil or coils at its pole or poles, and a thin and flexible plate of iron or other inductive material fixed round its edge, over all the flat circumference near and at right angles to the magnetic pole; whereas the De Locht-Labye telephone is characterized by the combination of a magnet provided with coils at its poles, with a rigid armature of soft iron or steel turning freely (as a free reed) on an axle, and terminated by a hammer striking against a rigid inflexible body of wood, ebonite, or any other substance. De Locht-Labye's hammer telephone can work under the same conditions as Bell's flexible disc telephone—*i. e.*, it can be employed in the double function of transmitter and receiver.

It now remains for us to explain clearly the inventor's idea of the working of the telephone as a transmitter. Every sound wave, on reaching the rigid part, imparts to it a sudden shock, which it transmits instantaneously to the hammer. The latter then separates from the rigid part, and gives rise to a slight movement, the extent of which is in proportion to the intensity of the shock—*i. e.*, to the intensity of the sound. But immediately the magnetic attraction acting continuously and with great force upon the armature, stops the movement of the armature lever, and restores it to its original position so that the movable part can receive a fresh sound shock.

These sudden movements (of the lever) of the armature before the poles of the magnet engender in the coils covering the poles instantaneous electric currents, equal in number to the movements of the armature, and therefore to the sound shocks. These instantaneous currents, passing through the line, on reaching the end of it, are received by a similar apparatus.

The working of the telephone as receiver is then easily explained. The intermittent instantaneous currents, of exceedingly short duration, traversing the coils of the telephone, says the inventor, magnetize and demagnetize at each emission. If the magnetizing current is produced first, it is powerless to produce the movement of the armature lever, on account of the reaction of the inflexible body on which the hammer rests. The demagnetizing current alone is capable of drawing back the armature, and consequently of detaching the hammer from the part on which it rests. This current being instantaneous, the movement is instantly arrested by the continuous action of the magnetic attraction, which restores the armature to its original position, and forces the hammer to strike against the block. It is this shock which produces the sound at the receiver. For each emission of the current there is one shock, and only one. Its force is proportionate to the energy of the current, and therefore to that of the sound shock at the transmitting telephone.

All these movements are sudden, and can in no way possess a duration equal to that of a sound wave of air. The armature and the hammer are, therefore, nearly always in a position of rest, ready to receive new shocks and to transmit them to a distance.

The telephonic transmission of speech, then, according to M. De Locht-Labye, evidently results from a series of shocks, and he believes from the working of this apparatus that, in order for speech and any kind of sound to be transmitted and reproduced, there must first be an equal number of sound shocks, little movements of the armature in the transmitter, and consequently of intermittent instantaneous currents of magnetization and demagnetization causing so many sudden movements of the armature at the receiver, and therefore so many blows of the hammer on the fixed part. There must be an exact interval of equal duration between two successive sound shocks, and finally the intensities of all these forces, the transformations of which reproduce the sound, must be in direct proportion to one another.

This is the conclusion to which M. De Locht-Labye's hammer telephone directly leads him.

We think that the description of this apparatus, and the explanations that we have given, may excite some interest, and M. De Locht-Labye has given us permission to state that he will be glad to receive, either through the medium of our journal or directly, any objections or requests for explanation that may suggest themselves, and that it will be both a duty and pleasure to him to answer them. We shall describe in a future number M. De Locht-Labye's "Pantelephone."

Colonel Logan H. Roots, Grand Master of Masons, and Generalissimo of the Knights Templar of Arkansas, was one of the distinguished visitors and a member of the Conclave at San Francisco. The Colonel served through the war with distinction, and served several terms in Congress. He is now a prominent banker and influential business man of Little Rock, Ark. His family is with him.

Mr. Charles R. Truex, special agent of the American Bell Telephone Company for the Middle States, made one of his brief but always agreeable visits here last week.

Colonel George L. Beetle, general agent of the Western Electric Company, is in New York. His many friends in the East will be glad to meet him.

General Superintendent Cassidy of the Hawaii Telephone Company has returned to Honolulu.

General Manager Lytle is making a tour through his Southern district, and we believe intends building several new exchanges at once. The Chesapeake Company gives promise of a boom now since he took hold of it.

One of the sons of Governor Andrew, of Massachusetts, is hard at work as repairer and lineman of a telephone company in Pittsfield, Mass.

Erie Telephone and Telegraph Company has bought 300 miles of the Government wire in Texas

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The Hudson River Telephone Company have started a telephone exchange at Ellenville, N. Y., with thirty subscribers.

Mr. Harry Thayer of the Western Electric Company of Chicago is spending a few weeks in New York.

General Manager Nicholson of the Central New York Telephone Company is seriously ill at his home in Rome, N. Y.

General Manager F C. Timpson of the Empire State Telephone Company, is superintending the business of the Mohawk Valley Company in addition to his own company and the Central at present.

It is estimated that the gain of subscribers made by the Erie Telephone Co. for July will reach 650. The officers of the New England telephone companies expect that September will show the largest improvement yet made by the companies, both in gross and net earnings and increase of subscribers. Since consolidation was off, there has been an increased demand for telephones, and also for stock, in the Lowell companies.

Dallas and her Connections by Telephone.

Mr. D. M. Clower, superintendent of the Southwestern Telephone Company for the district embracing North Texas, arrived home the 6th inst., from a general tour of inspection of the lines in his territory. A *Herald* reporter learned from him something concerning the telephonic connections that Dallas now has with other points. The line from Dallas to Cleburne, a distance of sixty miles the way it runs, was completed yesterday morning. The posts for a line from Dallas to Sherman are nearly all in position, and a force will begin Monday to stretch the wire, and when completed the line will be sixty-four miles long. At present Dallas has connection with the following points in this and other counties: Eagle Ford, Grapevine, Arlington, Waketown, Denton, Lancaster, Red Oak, Lisbon, Waxahachie, Garrett, Ennis, Midlothian, Alvarada and Cleburne. The company contemplate at an early date connecting Dallas with Terrell, Kaufman, Gainesville, Weatherford, St. Joe, Burlington and Waco. Mr Clower says that Dallas does a fine-paying telephone business, and that it is a great convenience to merchants and business men in this city and of those towns that have connections with it.

The telephone line is now completed from Castroville to Brackettsville, one hundred and thirty-five miles distant from San Antonio, Texas.

Opening of a Telephone Line in Mexico.

INAUGURATION OF THE TELEPHONE LINE BETWEEN THE CITIES OF VAJACA AND OCOTLAN.

The esteem in which the telephone is held in Mexico may be seen from the following, taken from the official journal of the government of Vajaca. At 2.30 in the afternoon of the 4th of August were assembled the Governor of the State together with the municipalities of the various towns through which the line passes, and the committee representing the President of the Republic. Speeches were made by the representative of the President, the Governor of the State, and responded to in turn. The greatest enthusiasm prevailed and the festivities continued the entire day, concluding with a grand ball, lasting till an early hour the next morning. The programme was as follows:

1st. At 5 A. M. was displayed the national flag from the government buildings and saluted by bands of music marching about the principal streets.

2d. At 8 A. M. were assembled all the public officers to go in procession to receive the Governor, with the national hymn.

3d. The assembled officials marched in civic procession, forming upon the four sides of the Plaza, where the orations of the day were pronounced and the address of the citizen Governor delivered.

In this brief space it is impossible to give but a rapid summary of the kindly expressions of good will toward the United States, which were responded to by Mr. A. G. Haines, director of the company, and translated into Spanish by Sr. Yañes.

By request of a large number of stockholders of the Suburban, Bay State, and Boston and Northern Telephone companies, the Executive Committee have decided to call a meeting of stockholders to take action regarding the rescinding of the vote to consolidate. At this meeting the capital stock of the Bay State and Suburban companies will be increased, to carry on the construction. The work of increasing the business will be vigorously pushed. The meeting is appointed for Tuesday, September 11. A meeting in Lowell at an early day of all the superintendents of the New England companies under Lowell management is talked of. Extremely favorable reports of the business of the various companies under Lowell management are being received at headquarters.

Improvement in Telephone Stocks.

There was a decided improvement in the market in our local telephone stocks Saturday last. Boston and Northern sold at 130; Southwestern, which is now Erie, in one-hundred share lots at 62¼ by auction. A better feeling on all stocks was visible both in New York and Boston, showing a general recovery of confidence in securities.

The Sunday *Herald* says: "Bell telephone is very strong again, but toward the close of the first board weakened with a sale of 35 shares at 240¾, against 241 at the opening. The closing bid was 240¼. In the afternoon the market advanced to 241. Mexican telephone sold at 2⅜ for 100 shares. The latest news from this company is cheering. The demand is said to average ten telephones per day. From an interview with one of the management, the following concerning the prospects of the New England telephone interests was written: Now that the New England consolidation of telephone interests has been abandoned, the matter of increasing and further developing the business will be rapidly and vigorously pushed, and it is said the increase for the section under Lowell management for the next few months will exceed anything in the previous history of their companies. While negotiations for the consolidation have been pending, business has been somewhat at a standstill, everybody awaiting developments. Now that a settlement has been reached, the continuation of the zeal and ability of the past is well underway. Some radical changes and improvements in the management of these interests are under advisement by the Lowell syndicate, and special attention will be given to the redistricting of the suburban company, the building of several important extra territorial lines in the States of New Hampshire, Vermont and Massachusetts, and, in fact, opening up all the undeveloped territory possible. With this action in view, and by request of a large number of stockholders, the Executive Committee have deemed it advisable to call a meeting of stockholders in the Bay State and Suburban companies in Lowell, September 11, at which it is probable that the vote to consolidate will be rescinded as unanimously as it was passed."

It is now authoritatively announced that the negotiations for a consolidation of the New England telephone companies have been dropped, and the Lowell stocks are beginning to look up in consequence. There is more inquiry for them than for some weeks past, and a rise is expected. In this connection it is announced that some changes and improvements are contemplated by the Lowell syndicate as to the management of these interests, and among these changes are mentioned the redistricting of the Suburban Company, the building of several important territorial lines in the States of New Hampshire and Vermont, besides Massachusetts, and also to open up all the territory possible yet undeveloped. With the above object in view, and at the request of several stockholders, the executive committee of the Lowell management have deemed it advisable to call a meeting of the stockholders of the Bay State and Suburban Telephone companies, to be held at Lowell on September 11, at which meeting it is probable the recent assenting vote for consolidation will be rescinded with as much unanimity as it was previously passed. At this meeting, also, it is expected that the capital stock of the Bay State and Suburban companies will be increased to enable them to make the contemplated extensions and improvements.

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May the Wires be Sunk?

The committee on underground communication, appointed by the several electric-tric light, telephone and telegraph companies—the Western Union excepted—has undertaken to solve a very important problem; a problem important not only to the various bodies which it represents, but to the general public as well. If it were practicable to group the wires of all the various systems under the bed of the street, and the expense of this was shared by all as it should be, the facilities for serving the public would be greatly increased, for the cost of connecting private dwellings and public offices would be very much lessened. Hence electrical service could be furnished more reasonably than at present and hence a greater demand for such service would be likely to follow. On the other hand, the unsightly spider's web of wires through the streets would disappear, and with it the still more unsightly poles. The tramp, tramp, tramp of the lineman and troubled hunter would no longer be heard upon the roofs of quiet-loving citizens.

The wisdom of the present movement to sink the wires cannot be too strongly commended. Those who have noted the constantly increasing demand for electrical service, and the continual appearance of new systems can readily imagine what the near future is likely to bring forth. Should the present system of stringing the wires from poles be continued, we may shortly expect to live, move and have our being in an entanglement to which the labyrinthine forest of the tropics will seem an unencumbered thoroughfare.

In commending the appointment of the present committee we do not wish to be understood as inferentially prophesying the success of the work which it has in hand. By no means. We mean simply that we believe that an underground system is necessary and therefore we hope an efficient one may be devised.

There are those, however,—able men, too—who do not believe that certain electrical systems, notably the telephonic, can be properly and efficiently worked underground, and if this is so, it would be a hardship and an injustice to compel the owners of such to operate them beneath the surface of the street.

Lieut. Greene, Engineer Corps U. S. Army, who recently investigated the underground system for the District of Columbia Commissioners, reported that the cost of the cable system, adopted by the telephone companies in Boston, with the special purpose in view of overcoming the retardation, was more than six times as much as the same number of conductors would cost on fixtures overhead, but he also came to the conclusion that the estimated cost of the underground cable was altogether excessive. In his report he declared the underground system to be "perfectly feasible for trunk lines;" expressed the conviction that immunity from storms and other overhead dangers may make it cheaper in the end than the overhead system, and recommended that the commissioners pass an ordinance prohibiting the further erection of any poles, except in the alleys, for the accommodation of individual telephone lines.

The General Committee on Underground Communication has our best wishes for its success.

Protection from Lightning.*

ELECTRICITY AND ITS ACTION — FORMATION OF THUNDER-CLOUDS AND STORMS — ELECTRIC INDUCTION DURING A THUNDER-STORM — A SAFE SYSTEM OF PROTECTION FROM LIGHTNING — FAULTS OF THE OLD SYSTEM — A LIGHTNING-ROD CONTROVERSY — THE RADIAL SYSTEM OF LIGHTNING CONDUCTORS.

Sometime ago we described a series of experiments made with a view of determining the efficiency of lightning-rods of an uncertain age. The surprise evinced by these results must have been very great, for the article in question was copied far and near, though we regret we cannot say it was always credited to the REVIEW.

The fact is, while other applications of science have advanced with rapid strides, improved means of protection from lightning has made haste very slowly toward discovery. As few persons have given their attention to this very important matter the exception should meet with a hearty welcome. Therefore it is that we take pleasure in introducing to our readers both here, in England and on the Continent of Europe Henry W. Spang, who is a proficient in the construction and setting of lightning-rods.

There are possibly those who may be repelled by the perusal of the preface to Mr. Spang's book, for it certainly has a somewhat bombastic tone. To such persons we would say that a perusal of the contents of the body of the book will indicate that its author, though by no means modest when speaking of himself and his system, is in reality a careful observer and an intelligent workman. Further than this we do not believe, having carefully examined his system, that a more efficient one has ever been devised.

Even to those who are not immediately in want of a lightning conductor, having as yet no house to set it against, Mr. Spang's little work on lightning protection will prove interesting reading, for it contains a treatise upon an interesting subject and one little understood.

The author quotes Prof. William Blasius, whose theory concerning the formation of thunder-clouds and storms may be said to rank second only to those of Admiral Davis and Commodore Maury.

Blasius thinks that a storm consists in the movement of the air caused by its tendency to reëstablish an equilibrium which has to a certain extent been disturbed, and all such movements whether light zephyrs or terrific blows, accompanied by more or less condensation or moisture or clouds, or even not so accompanied, should be characterized as storms.

Thunder-storms, according to Mr. Spang, are due to the rapid movement of the polar or cool ærial current toward the south. He says that as the polar current progresses toward the south the condensation of vapor increases and begins to be precipitated, which action sometimes takes place so hurriedly and in so large a scale that the whole process becomes plainly visible. The great violence with which the equatorial current rushes over the polar current, so different in temperature and density, no doubt, he says, produces by friction a great quantity of electricity, so characteristic of these storms.

During a snow-storm, accompanied by a high wind, Mr. Spang says, electricity is generated in the air, which indicates to him that friction, caused by the rapid movement of the air in connection with condensed vapor or snow, is one of the principal causes of the production of atmospheric electricity.

One of the most interesting chapters in Mr. Spang's little book is that which is devoted to a description of the defects of the present system of lightning conductors. It is here explained that in the system which has been in vogue for the last decade, no attention has been given to the area, action and properties of the electricity of the atmosphere and earth.

Galvanic electricity, says Mr. Spang, has a medium quantity and a low potential of tension. In the electricity generated by friction the quantity is small and the potential high, while the electricity of the air and earth when in motion as in a zig-zag lightning discharge, combines great quantity with a very high potential, and is capable of producing effects which cannot be obtained by galvanic or ordinary frictional or induced electricity.

Thus, he explains an artificial electrical discharge, produced by a Ruhmkorff coil or Holtz machine, can barely pass through two feet of air or several inches of glass, while a lightning discharge can readily pass through two miles of air and twenty feet of solid rock.

In his opinion—an opinion, by the way, which experience has shown to be sound—the rods and cables now in use to protect dwellings and other structures are too concentrated, and do not allow for the expansive action of lightning discharges, and therefore are, in reality, little protection. That is to say, the rods now in use may be expected to protect little else than the particular portion of the buildings against which they are set up. Each of the four corners of a building should, in the opinion of Mr. Spang, be protected. The electricity of the clouds and earth have, he says, a very strong tendency toward each other, particularly when in close proximity, and will not follow a metallic conductor when it is an indirect route about a building.

The rods now in use are not, in his opinion, sunk deep enough in the ground to enable the electricity of the clouds to readily unite with the electricity of the earth, which, he says, is for the most part accumulated in the subterranean water bed and not in the surface.

Another interesting chapter of the book now before us is that devoted to an exposé of a system of lightning-rods recently devised by a Kentucky man, and now said to be in extensive use in the West and Southwest. In this system, which Mr Spang declares to be founded on an error, an iron rod is placed along and above the ridge of a building, with points at each end projecting upward, and supported by large glass insulators. There is no rod connected with the earth, nor any electrical connection with the building whatever.

In a pamphlet which has been issued by the company seeking to introduce this unique system, the purpose of the rod is "to prevent a stroke of lightning by keeping the potentials equal, or so nearly so as to prevent a disruptive discharge from the clouds, or, in case it fails to equalize the electric tensions and a disruptive discharge toward the house should follow, it would be received on one of the points of the rod and thrown back into the air in a diffused state from the other points."

This action, Mr. Spang says, is based upon an experiment in which it is claimed that if one end of a curved metallic rod, supported by an upright and a wooden base, is applied to a charged prime conductor of a frictional electric machine, the electricity therefrom will flow out of the opposite end in the form of a brush. "But," says Mr. Spang, "experience has fully demonstrated that, owing to the great height and area of the thunder-clouds, the function of keeping the potentials of the electricity of the clouds and earth equal cannot, as a rule, be accomplished even by a rod well connected with the earth, and much less by one disconnected therefrom."

This being the case, Mr. Spang says that if any building having such a rod affixed has been left uninjured by a lightning discharge, its protection has, beyond doubt, been due to a metal roof electrically connected with the earth either directly or through a large flow of water from the rain pipes at the time of the discharge, or by means of other vertical metallic conductors about the building.

It seems that the projectors of this system of lightning-rods have, in a pamphlet published in support of its efficiency, drawn upon Bible history in support of their theory, claiming that "Solomon's temple, which stood for one thousand and eighty-two years in a land of thunder storms, was protected precisely on the same principle" as that upon which their system is founded. Against the truth of this assertion Mr. Spang puts in a vigorous protest, in doing which he shows that he has not allowed his researches into the theory of electrical phenomena to interfere with his explorations in Biblical history, and introduces the somewhat novel feature of theological discussion into the controversy of the relative merits of rival lightning-rod systems.

"The protection of the said building (Solomon's temple), which was fairly exposed to the violent thunder-storms which prevailed in Palestine is," so says Mr. Spang, "explained as follows: The roof thereon was made of cedar wood, which was covered

*A Practical Treatise on Lightning Protection. Giving complete and explicit instructions for the protection of buildings and explaining the defects of the lightning conductors now erected. By Henry W. Spang. New York: D. Van Nostrand, publisher. (Revised Edition.)

with thick gilding. In order to prevent the birds from alighting upon and defiling the gilding upon the roof, long, upright spears of steel, pointed and gilded, adorned the roof. These metallic spears connected with the thick gilding of the roof, and the gilding connected with the metallic rain-pipes, which terminated in the water pools under the porch of the temple, thereby constituting—not by design, but fortuitously—a reliable combination of lightning conductors."

As to whether Mr. Spang or his rival has the best of this discussion of a nice point of Biblical history we will not attempt to decide; first, because we are not theologians, and, second, because whether he has or not would have absolutely no bearing whatever upon the relative efficiency of the two systems; but from a purely scientific and practical standpoint, Mr. Spang leaves his rival a long distance in the background; for, even if the testimony of the many eminent authorities against the so-called "Chambers" system, which Mr. Spang adduces wanting, the most casual observer could discover that the theory upon which this Chambers system is founded rests upon a total misapprehension of some of the simplest physical laws, and would seem to be, instead of a protection, an absolute invitation to vagrant lightning. On the other hand, Mr. Spang's system of protection from lighting seems to be founded on well-established physical laws, and is altogether as efficient a system as we have ever been called upon to examine.

Action of Electricity of Air and Earth During a Lightning Discharge.

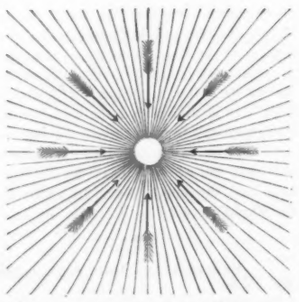
In determining the action of the electricity of the air and earth while uniting during a lightning discharge, scientists have erroneously been governed by experiments made with the Leyden jar or prime conductor of a frictional electrical machine.

The small quantity and area of accumulation of electricity, as well as the short distance between the opposite electricities in such experiments, are quite infinitesimal, compared with the great quantity and area of accumulation and long distance between the opposite electricities contained in the clouds and earth.

Experiments with artificial electricity can not possibly demonstrate the action of the electricity of the clouds and earth during a lightning discharge, and therefore are not proper and practical illustrations thereof.

It is asserted by æronauts who have been in and above the clouds during a thunder-storm that when there is a lightning discharge between the lower part of the clouds and the earth there is a simultaneous and concentrative flow of electricity in the clouds toward the lower layer thereof.

From observations made by the writer during the past twenty years he has found



that there is a strong flow of electricity from all directions in the earth, within a radius of about 3,000 feet, toward a central point, as shown in Fig. 1, in line with which the electricity of the air and earth unite during a lightning discharge.

This concentrative flow of electricity of the earth during a lightning discharge, also the great expansive action of the electricity from the clouds as it approaches the earth, is manifested by the following phenomena:

The great affinity of the electricity of the cloud and earth for a herd of cattle, a large assemblage of persons, a large quantity of hay, grain, ice, powder or other material in bulk—a large body of water, a large deposit of ore in the earth, a metal roof with its rain-pipes connected with metallic drain-pipes leading into sewers in the earth, an oil tank with its underground pipes, also for telephone lines in cities and towns which radiate in different directions and terminate in the earth in the said p'aces.

The shattering of telegraph or telephone poles for a long distance by a single lightning discharge, when unprotected by lighting conductors.

The breaking of the electric current through thick walls between the gas and water pipes upon the inside of buildings and the ordinary lightning conductors upon the outside thereof.

In the case of the All Saints' Church in Nottingham, England, about thirteen years ago, the electricity from the clouds descended in line with the lightning conductor, and that from the earth, which principally concentrated upon and flowed along the underground gas mains, united by breaking through a wall of solid masonry 4½ feet thick, which separated the lightning conductor upon the outside of the building and the gas-pipe upon the inside thereof.

The frequent killing or injuring of every person or animal within 15 feet of the base of a tree, and the shattering of all the masts of a vessel by a lightning discharge, as was frequently the case before the application of lightning conductors to the masts, also the many instances of lightning discharges taking place in line with the hay and grain stored in the lofts of barns, not only demonstrate the said concentrative flow of electricity in the earth and water, but also the great upward tendency of the said electricity as it approaches that descending from the clouds, and the great expansive action of the electricity from the clouds as it approaches that concentrating in or arising from the earth.

THE PATH SELECTED BY A LIGHTNING DISCHARGE.

It must not be supposed that the electricity accumulated in the thunder-clouds and that contained in the subterranean water-bed pursue an experimental path through the intervening air, objects and surface soil to unite with each other; on the contrary, before the slightest movement has taken place, the said electricities have, by induction, selected the shortest and best path which they will take, passing over such objects upon and in the earth which offer the widest and easiest scope for the concentrative flow of electricity in the earth to unite with the electricity descending from the clouds.

A lightning discharge will invariably take place in line with a tree, man or animal in an open field, a ship or vessel upon the sea or other body of water, a spire of a church, a flagstaff, chimney and any other elevated projection of a building, and particularly in line with a building having a metal roof and metal rain-pipes electrically connected with the earth, also with one filled with hay, grain, ice or other material in bulk, for the reason that they offer the shortest and best route and the widest scope for the electricity of the clouds and earth to unite.

Under certain favorable conditions at two or more points upon the earth within a radius of about 2,500 feet, the electricity from the clouds will fork or separate into two or more branches before it reaches the earth and unite with that of the earth at as many points, varying from 20 to 2,000 feet apart, and thereby giving rise to the so-called "freaks" and "lateral discharges."

That Multiplex Shirt.

Were there not already too many books in the market, it would be a good idea for some patient delver into the past to write a volume on the "Genesis of Jokes." Such a work, could its circulation be confined to newspaper offices, would be a blessing to the professional funny men of the press, as they would then have the complete records of the past upon which to erect the elaborate witty paragraphs of the present. But should such a volume ever see light, and achieve general circulation, what a "give away" it would be upon those same journalistic jokers, without which no well-regulated editorial staff is now considered complete. Their labored and loosely constructed puns would therein be traced back to the time of the great strike at the tower of Babel, and the pedigree of our modern funny stories would prove that many of them are lineal descendants of a select few taken aboard the Ark in the busy brains of Shem, Ham, and Japhet, who, in the bustle and confusion of a hurried embarkation, forgot to forget them.

But all "funny" stories are not old. Occasionally something new in that line turns up, something that the possible volume mentioned would have to pass in silence, as having no ancestry to be proud of and no posterity to hope for; something so strikingly original that its funniness is forgotten in wonderment at the genius of its inventor. When such a new invention in jokes appears its treatment is terrible. Its fate "isn't so darned funny," to use the words of the honest 'granger, who listened laboriously to the inspired platitudes of the Rev. Joseph Cook for two weary hours, under the mistaken idea that he was hearing the witticisms of Mark Twain. A new joke is soon worn threadbare and bald by the dailies, then the weeklies whack the life out of it, and the remains are stereotyped for the use of the "patent inside" periodicals with which our unfortunate country cousins are afflicted; and finally, what can be gathered together at the end of a few months is carefully embalmed and decently interred in the columns of our religious contemporaries.

One of these funny little things went the regular rounds two or three years ago. You all remember it well. It related to Edison and his wonderful shirt. At that time Edison was fair game for every quizzical quill. Whatever was written about him was eagerly read. He was then being washed in by the waves of his own creation to his present golden shore, and his friends never failed to cheer when he appeared on the crest of a breaker, while the cynics "only saw him when he was out of sight." In Wall street parlance, his stock was then being "bulled" by his friends and "beared" by his enemies—or rather by the steady-going conservatives who took newspaper reports of his wonderful doings with liberal doses of salt. In consequence of all this, the story about his shirt saw double the usual amount of service. From events that have since transpired, there appears to be only one paper in the United States which failed to make immediate use of the shirt story. That paper, if we take its word for it, is a "monthly journal devoted solely to industrial interests, art, science, and manufactures," and it is published in the thriving town of Cincinnati, State of Ohio. But it appears that the conscience of that paper's editor troubled him for having omitted to give his scientific readers an account of this wonderful shirt; so a few weeks ago he called together his careful compositor, his positive proof-reader, and his fearless foreman, and with their assistance he resurrected that which had so long been buried. Finding it in a tolerable state of preservation, they hoisted it, with infinite labor and much perspiration, to the top of their leading editorial column, where it shone fearlessly forth as follows:

"Mr. Edison has put his electric light to sleep for a little while, and turned his genius to the manufacture of shirts. He has invented a laundry defier. He has hoisted the black flag against the washerwomen. The shirt is made in imitation of very fine linen, though it is compounded of a material of which Mr. Edison alone has the secret. There are 365 layers of the material, which permits of a clean shirt for every day in the year, the wearer only being put to the trouble of ripping off the outer layer when he wishes to effect a change of linen. The collars and cuffs are detachable, and are renewed with the same economical simplicity. These shirts can be had at the exceedingly reasonable price of $6 per half dozen. The only trouble with the invention is that it is yet in the mind of the inventor, not having got upon his back."

For fear this weighty piece of valuable information would topple and fall from its elevated position, it was secured firmly in place by the following chunk of Cincinnati sugar-cured wisdom:

"The trouble with all of Edison's inventions is, they always remain in his mind. He has ideas just like the layers in the shirt, one for each day of the year, but, like the shirt, only good for that particular day. Further than this, while his shirt is in imitation of linen, so with his ideas, they are always in imitation of something else that somebody else has made. How we do ache for that electric light that was such an immense success in February, 1878. Let us have light or shirts."

It is really too bad that in these days of inventive genius and ready-made clothing a journal devoted to science and Cincinnati should be suffering for illumination and undergarments. Can it be that in the Queen City of America and the age of electricity an enterprising editor is compelled to dwell in darkness and drawers?

Seriously speaking, it is strange that such an opinion of Mr. Edison's labors can be formed by any intelligent person. Making every possible allowance for the inflated estimates of the value of Mr. Edison's inventions formed by interested insiders and enthusiastic outsiders, there remains enough to prove him one of the most extraordinary of inventors. It is not necessary to defend him against our Western contemporary's charge of imitation. The Patent Office examiners have settled that question in a very practical manner. As to his inventions remaining in his mind, all of them, facts tell a different story, and facts have a well-known habit of being too stubborn to take water for a mere assertion. The only excuse for introducing this threadbare shirt story here is a desire to show what wild and unveracious comments may be made upon it, in the face of evident facts, by a journal claiming to be an exponent of industrial progress—a journal that should be thoroughly informed upon the industrial progress of the most progressive of all industries, namely, that pertaining to the electric light.

To show that Mr. Edison's inventions sometimes go farther than his mind, it is enough to point to the fact that he has patented between three and four hundred of them, about two hundred of which bear upon the electric light. That his ideas are good for more than the particular day that gives them birth is proved by the fact that between five and six thousand people are to-day earning their bread-and-butter by putting the results of them into marketable shape. There are over three thousand people working for the different Edison companies in this country alone, and nearly an equal number in Europe. The money invested in working the Edison patents in the United States amounts to $2,770,000, with the same amount in foreign countries; and the market value of the stock is just about double the entire sum.

And notwithstanding this effect of one man's ideas upon the world's industrial progress, this actual creation of value, our scientific contemporary flies the resurrected tail of that multiplex shirt from its editorial mast-head, and aches to see the Edison electric light, which was "such an immense success in February, 1878," and of which there are now about a hundred thousand in nightly use. Mr. Edison has done his part in furnishing the light; the "aching" editor will probably have to procure his shirts through the regular commercial channels.

Charleston, S. C., is rapidly growing in commercial and industrial importance. Her commerce during the past year reached $75,000,000, while 6,500 persons were employed in manufacturing.

The Old Colony freight houses and wharf at Fall River, are being lighted with electric lights.

Seventy-five telephones are now in successful operation in Mitchell, Texas, and new lines going up every day.

The Southwestern Telephone Company has bought the old United States telegraph line from Mitchell to Coleman, Texas.

A New Long-Distance Telephone.

It is currently reported, says Saturday's Montreal *Witness*, that Mr. Senecal, on his return, will take a prominent interest in the development of a new system of telephoning. A recent experiment was made between this city and St. Alban's, which is reported to have worked admirably. Mr. Webster Gillette claims to have invented an instrument over which conversation can be carried on between points 2,600 miles apart—a distance as great as that between Liverpool and New York. Another company, called the "Overland" Company, of New York, of which Mr. R. G. Dun is the head, was to have made an experiment between Montreal and Toronto, but a telegram was received this morning that the works where the electrical machines are manufactured in New York were burnt, and the experiment would have to be postponed Professor Thompson, of the United States Electrical Department, was to have been here this morning to superintend the experiment, but owing to the fire could not come. The company intend forming a Canadian syndicate, and all the stock has been taken up. The Overland claim to have "killed the induction," which means that other wires running parallel with telephone wires will not affect the instrument, and this has been the difficulty in the past that telephone men have been trying to overcome.

Storm Sounds in a Telephone.

A correspondent of *L'Ingenieur Conseil*, signing himself with the initials "E. B.," occupied himself during the violent thunderstorm which occurred at Brussels on June 30 in listening to the storm sounds in the telephonic wire. It was, of course, furnished with a good lightning conductor, and, under such circumstances, he is convinced that the experiment was not attended with danger. During the height of the storm there was a continuous noise, which could only be compared to that of frying. From time to time it would grow louder; sometimes there would be a little popping sound, like a bubble bursting; sometimes the series of crackling noises which follow the fall of a drop of grease on a red-hot iron plate. This last noise came abruptly and loud with each flash of lightning, and seemed to precede it. The observer was satisfied that his ear was surprised by the sound before his eye was surprised by the flash. The same noises were often produced when there was no accompanying flash, but then they were less loud. Their force seemed to have no connection with the peals of thunder. On the six hundred lines of telephone wire which focus at Brussels, not one apparatus was damaged by the storm, its effects being altogether expended upon the lightning conductors and storm-warning apparatus. This security may encourage other observers to follow the example of "E. B.," who considers that in this manner it is possible to obtain valuable contributions to the study of atmospheric electricity. He is of opinion that the constant noise heard in the wires proves the existence in them of a current of atmospheric electricity flowing into the earth, and that a network of telephonic lines overspreading a town would be its best possible protection against lightning.

Bronze for Telephone Lines

The careful investigation instituted by E. Van Der Ven of the Teyler Foundation, on wires made of the metallic alloys, known as phosphor-bronze and silicon-bronze, are the more welcome on account of the discussions had, particularly at the Paris Electrical Congress, concerning the practicability of their use.

The wires experimented with contained, according to chemical analyses made for him by M. Van Eyndhoven, in the case of the phosphor-bronze:

Copper, 95.5 per cent.; phosphorus, 2.6 per cent., with small quantities of tin, manganese and silicic acid. In the silicon-bronze:

Copper, 92.2 per cent.; silicium, 0.91 per cent., together with small quantities of tin, manganese and antimony.

The practical results of Dr. Van Der Ven's researches are that phosphor bronze has about 30 per cent. of the conducting power of copper, silicon-bronze about 70 per cent., while the steel as used in wires has only about 10.5 per cent.

Comparing their tenacity, as also very carefully determined by him, with that of steel, he finds that a wire of the latter material, of 2 mm. in diameter, with quadruple security and the conventional sag of .7 m., can have a stretch from pole to pole of 130 m., while the stretch, under the same conditions, of a wire 1 mm. in diameter would for phosphor-bronze be 106 m., for silicon-bronze 91 m. These alloys, with a diameter 1.18 and 0.77 mm. respectively, have the same electrical resistance as the steel wire of 2 mm. in diameter.

"The relatively short stretch which in general increases the expense of construction and maintenance is less costly in cities where at short distances the roofs of buildings offer points of suspension for telephone wires. It goes without saying that the bronze wires are preferable to those of steel, whose resistance demands a much larger section; the more, since the network of lines suspended in the air cannot be counted among the ornaments of a large city."

To this result we may add the statement made by M. Bede at the congress:

A phosphor-bronze wire of .8 mm. (costing the same as steel of .2 mm.) would on account of its high elasticity coil up before it has fallen 4 m. from its original position—so rapidly that on breaking it would ordinarily not strike the ground, and hence would be less dangerous. On account of non-oxidation there is no loss of diameter.—*Franklin Institute Journal.*

Concerning telephone matters which were recently reviewed by the Boston *Herald*, our esteemed contemporary the Lowell *Courier* of the 5th inst. has the following interesting and valuable information:

The Boston *Herald* has a column and a half of telephone gossip this morning which really contains nothing which was not already known to Lowell people.

It represents a Lowell stockholder as anxiously wandering about Boston to find sympathizing ears into which to pour his story. He proceeds to relate the methods of the Lowell syndicate in the purchase and sale of the various properties on which they have made their money. Everybody knows that their experience and familiarity with telephone management enabled them to calculate with reasonable certainty what a given territority might be developed to do; and when they found a chance to purchase a good piece of telephone property they did so, buying always, as any prudent man would do, at the lowest possible price. They then sold in part to other parties, who like themselves desired to make some money if they could do so fairly and honorably, and these gentlemen have capitalized their property at such figures as they deemed advisable, and then sold a portion of their shares, as people might want to buy for investment purposes. There is nothing mysterious about this, and nothing with which anybody has any right to find fault.

It is no more reprehensible than the selling of a car-load of horses at Ohio prices to one of our Lowell horse-dealers, and he selling the individual animals at a round profit to individual citizens. Provided the horses were what was represented, and were fairly worth the money paid, no purchaser could find fault—even though horses from some cause grew suddenly dear, and later again fell off in price to somewhere near what they were originally sold for. Nor could any second-hand purchaser fairly complain, if, having paid the temporary maket price, he had individually "got stuck" with his one or two horses. Let us see briefly just what the Lowell syndicate have done.

They bought first, early in 1882, the National Bell Telephone Company of Maine, paying $110 a share for every share of the stock, and selling it at the same price to anybody and everbody who would purchase, and it did not meet with a very ready market either. But under the syndicate management the Maine has paid 15 per cent. on its cost, and the stock went up in open market to an extreme limit of about 280.

A stock dividend was recently made on the basis of an average value of 240—or three shares at 80, at about which figure it is now quoted, paying 5 per cent. dividend on a par of $100.

In May, 1882, the Boston and Northern was purchased by the syndicate at $90 a share, and everybody who wanted it could be supplied at that price. Lowell capitalists were begged to go in, and did so timidly and cautiously. The syndicate made its money by boldly taking 2,000 shares of the stock, which, as it earned an average dividend of 10 per cent., with certain other advantages as to taking new stock, carried the price quickly up to 165.

The Suburban came next in August the same year, for which the syndicate paid $75 a share. This earned and paid an average dividend of 8 per cent. on a par of $100, and the stock, of course, went up, and those who had sagacity and courage to buy made a good thing of it.

The Bay State was the last of the distinctively syndicate purchases in New England, and it was the poorest purchase of all. It was bought at a higher price than the others, and because it surrounded certain other territory owned by the syndicate, and was needed to render convenient the operation of the exchanges surrounded by it. The syndicate paid $116 a share, and it is the only syndicate stock now selling at a figure lower than the price at which it was bought But it pays fully 7 per cent. per annum on its par value

We have not at hand the figures at which these stocks have sold, but it is certain that every one of them to-day, with all the disturbance created by the proposed consolidation, in the midst of almost a general panic in the stock market, and with all the scarecrows raised about the telephone patents, is selling at a handsome advance over the price at which they were openly offered to all the world. Every one of them, too, is actually earning and paying a handsome percentage of dividend on the prices at which they were quoted. It is this dividend earning and paying which, as we have remarked, keeps the stocks fairly above water in the midst of a very deluge of depreciation.

And this is all there is to the mystery of the Lowell syndicate, relative to the New England companies. The Northwestern, Southwestern and Erie, now consolidated in the Erie, were all purchased by the syndicate and sold to second parties at a profit. But the two former to-day stand at a handsome figure above their original cost, and the new Erie is quite well sustained at the price which the public has been asked for it; while the syndicate claim that its prospects are better than those of any of the other companies under its management, so far as business and dividends are concerned.

As for the Drawbaugh invention, we remark that if the best that is claimed for it should result, it only makes telephones free to everybody, and whatever effect that might have on the Bell Company, it would not necessarily affect the syndicate companies. Drawbaugh has no patent, and does not claim to have any. He simply claims priority of invention, and if he establishes this claim he would hardly be in a position to sue anybody for infringement of an invention not patented. Should his patent be secured, who would be in so good position to use it as the companies now existing, with their plants, equipage, and experience?

The telegraphers' strike has resulted, as we confidently expected it would end, in the discomfiture of the strikers. Not only were they unsupported by the "Knights of Labor," or whatever that organized body of intruders into other people's business may be called, but the strike was arranged, in almost every particular, in such a manner as to put the operators at the worst possible disadvantage. To begin with, its management was intrusted, in the blindest way, to irresponsible outsiders, who had no real connection with the Western Union or any other great telegraph company. Then it was so contrived as to inflict a very serious and most unnecessary loss and inconvenience on the general public. Again, it trusted far too confidently to the dislike and suspicion of the Western Union, growing out of transactions, or supposed transactions, which had nothing whatever to do with the rate of wages. And still further, the operators grossly exaggerated the difficulty of their work—which can be very easily learned, and requires no exceptional amount of skill, and which is, on the very face of the whole affair, so attractive on account of its ease or cleanliness, or respectability or some similar reason, that the demand for employment is not sufficient to exhaust the supply. And when the telegraphers complained that on their average wages they could not live in comfort, they forgot that there are hundreds of clergymen who live on far less, and never dream of disturbing the commerce of a whole nation for the sake of an increase of salary. We very heartily wish that the telegraphers were better off, and admit as a matter of course their perfect right to combine in an application for higher wages, if they think that, by such combination they can get them. But this is a very different thing from an irresponsible committee making demands upon a large company with which it has not the slightest right to interfere, and by which its members are not employed. It may very safely be affirmed that any loss, short of irretrievable bankruptcy, would have been less disastrous than for a great corporation to submit to dictation from outsiders as to the management of its private affairs. Meanwhile many hundreds of thousands of dollars, which might otherwise have been devoted to the increase of wages, have been utterly lost to the telegraph companies by the action of the strikers.—*American Literary Churchman.*

Mr. Harry C. Haskins, of the Wisconsin Telephone Company, has been visiting in New York for two weeks past.

The *Grocer*, London, predicts that Russian petroleum will gradually prove a formidable rival to American oil in the German market, especially the eastern provinces. Several reservoir cars, it says, have recently arrived at Bromberg direct from Baku, delivering their cargo at a price lower than American petroleum *via* Bremen, and of the same quality.

Telegraph Agreements.

BOSTON, Sept. 8, 1883.

A special meeting of the stockholders of the Rapid Telegraph Company has been called for September 18 to ratify the contract between that company and the Bankers and Merchants' Telegraph Company for the extension of the Rapid's lines and to authorize the issue of 6 per cent. gold mortgage bonds for $3,000,000 in accordance with that contract. It is understood that the Merchants' Company will furnish the $3,000,000 necessary for the extension of the Rapid's lines, and that the whole will be bonded for that sum, and the bonds issued in exchange for the Rapid's stock.

SPRINGFIELD, OHIO, Sept. 9, 1883.

Mr. Editor:

The system of laying electrical conductors, shown in REVIEW of 6th instant, is covered by British patent granted us October, 1882.

Respectfully,

WILLIAM E. BANTA,
JOHN M. DODD,
A. M. CROTHERS.

An employe of the Bethlehem Iron Works has received a patent on a sewing-machine needle. It is stated that the Singer Sewing Machine Company has offered $30,000 for the exclusive right to use the same on their machines,

Telephone Stock Quotations.

American Bell Telephone Company	236½
Bay State Telephone Company	123
Central New York Telephone and Telegraph Company	101
Boston and Northern Telephone Company	135
Empire State Telephone and Telegraph Company	203
Granite State Telephone Company	95
Hudson River Telephone and Telegraph Company	110
Long Island and New Jersey Telephone Company	100
Mexican Telephone Company	2½
National Bell Telephone Company of Maine	90
New York and Pennsylvania Telephone Company	100
Northwestern Telephone Company	100
Southwestern Telephone Company	68
Suburban Telephone Company	139
Southern Bell Telephone and Telegraph Company	125
Tropical Telephone Company	3
Central Union Telephone Company	105
Iowa Union " "	100
Missouri and Kansas Telephone Co.	98
United Telephone Company (Kansas and Missouri)	89
Bell Telephone Company, of Missouri	165
Wisconsin Telephone Company	130
Cumberland Telephone Company	105
Great Southern Telephone Company	102
Michigan Telephone Company	100
Chicago Telephone Company	290

NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPTEMBER 4, 1883.

284,355 Circuit for secondary electric clocks; Henry L. Bailey, Brooklyn, N. Y.

284,354 Electric spark arresting circuit and device; Henry L. Bailey, Brooklyn, assignor to Time Telegraph Company of New York.

284,357 Dynamo-electric machine; Charles E. Ball, Philadelphia, Pa.

284,365 Electro-magnetic car wheel and brake; Henry M. Beidler, Texarkana, Ark.

284,171 Furnace for baking incandescents; William H. Boulton, Cleveland, Ohio.

284,382 Circuit and apparatus for electric temperature and pressure indicators; Charles L. Clarke, assignor to R. Hewitt, Jr., New York, N. Y.

284,277 Dynamo-electric machine; William B. Cleveland, Cleveland, Ohio.

284,288 Dynamo-electric machine; William B. F. Elphinstone, Musselburgh, Scotland, and C. W. Vincent, Holloway, County of Middlesex, England.

284,289 Preparation or production of insulating materials or articles; John A. Fleming, Hampstead, County of Middlesex, England.

284,409 Incandescent electric lamp; Tom E. Gatehouse, Camberwell, County of Surrey, England.

284,292 Dynamo-electric machine; James E. H. Gordon, Kensington, County of Middlesex, England.

284,413 Conduit for electric wires; Imlah M. Green and J. P. Birch, Philadelphia, Pa.

284,297 Telegraph blank; Newton W. Hartwell, Louisville, Ky.

284,420 Electric lighting; Killingworth W. Hedges, Westminster, County of Middlesex, England.

284,423 Compound electric conductor; William B. Hollingshead, New York.

284,425 Telephone and telegraph cable; Charles Huck, New Orleans, La.

284,426 Telephone and telegraph cable; Charles Huck, New Orleans, La.

284,216 Flexible electric conductor; Henry B. Lytle, Boston, Mass.

284,226 Apparatus for filling cables with insulating substances; William R. Patterson, assignor to Western Electric Company, Chicago, Ill.

284,480 Electro-magnetic rheotome; Frank L. Pope, Elizabeth, N. J.

284,481 Telegraphic apparatus; Frank L. Pope, Elizabeth, N. J.

284,247 Switchboard for electric light stations; Robert J Sheehy, New York, N. Y.

284,497 Electric arc lamp; Robert J. Sheehy, New York, N. Y.

284,505 Combined support and switch for electric lamps; Henry W. Spang, Reading, Pa.

284,508 Automatic circuit closer for telegraph keys; Samuel J. Spurgeon, Liberty, Mo.

284,577 Secondary or storage battery; Eli F. and E. E. Starr, Philadelphia, Pa., assignors of one-half to W. J. Peyton, Washington, D. C.

284,255 Electric motor; Levi W. Stockwell, Cleveland, Ohio.

284,578 Primary electric clock; D. Fred. Sweet, Hastings, Mich.

284,348 Storage battery; Cornelius T. Tomkins, New York, N. Y.

284,343 Secondary battery; Alfred Tribe, Denbigh Road, Nottinghill, County of Middlesex, England.

284,516 Electric lamp-lighting device; Henry Van Hoevenbergh, Elizabeth, N. J.

284,348 Electric call and signal; Le Roy S. White, Waterbury, Conn.

284,527 Multiple signal-box for fire and district telegraphs; John C. Wilson, Boston, Mass.

Manufacturing News.

The Sawyer Woolen Company of Dover, N. H. is erecting a storehouse for imported bonded wool, which will have a capacity for $300,000 worth of that product.

The Pittsburgh Plate Glass Company has been organized in Pittsburgh, Pa., with a capital of $600,000. The works are to be situated at Creighton Station, on the West Pennsylvania Railroad.

October 1st is the date fixed for the starting of the Massillon Paper Mills, at Massillon, O., burned July 4th. The main building, which is of brick with stone foundations and a fireproof roof, is 60x70 feet.

The new cotton mill at Henderson, Ky., has been organized with a capital of $300,000, of which $100,000 is Eastern capital. Its mill will be 324x95 feet, three stories high, and it will operate 21,000 spindles.

It is stated that R. H. Wolff & Co.'s wire mills and steel spring works, Amesville, near Peekskill, N. Y., which with the machinery were burned recently, will be rebuilt in Brooklyn, N. Y. The Amesville works employed 350 men.

Value of the Metallic Products of the United States in 1882.

Pig iron, spot	$106,336,429
Silver, coining	46,800,000
Gold, "	32,500,000
Copper, at New York	16,038,091
Lead " " "	12,624,550
Zinc " " "	3,646,620
Quicksilver, at San Francisco	1,487,537
Antimony " " "	12,000
Nickel, at Philadelphia	309,777
Platinum, at New York	1,000
Total	$219,756,004

Telephones in Public Schools.

The Sub-Committee on Office of the Educational Board, Philadelphia, Pa., are now considering the suggestion of Superintendent McAllister relative to the placing of telephones in the grammar schools to be connected with the headquarters of the Board, on Filbert street below Eighth. The advantages to be derived from the establishing of such a service, the superintendent thinks, cannot be estimated too hightly. At the instigation of the committee Superintendent Morton of the Bell Telephone Company has given an estimate of the cost of this innovation, which he places at $3,000.

The ELECTRICAL REVIEW is a weekly journal of electric light, telephone, telegraph, and scientific progress, published by Delano & Co., New York, at $3 a year. We have read the number of August 30th and find it a very interesting and instructive paper, one that every one could read with profit, as it contains much information of use to the general reader. We should be pleased to receive it regularly.—*Manchester Enterprise.*

Mr. Henry W. Spang has written, and Mr. D. Van Nostrand has published "A Practical Treatise on Lightning Protection," with illustrations. It gives complete and explicit instructions for the protection of buildings and explaining the defects of the lightning conductors now erected.—*Evening Telegram.*

BUSINESS NOTICES.

Bradley A. Fiske, Consulting Electrical Engineer, 59 Astor House. Advice to inventors, calculations, etc.

SITUATION WANTED—By a young lady in a telephone exchange; has had three years' experience in the business, and is thoroughly well posted. Address Lock Box 22, Schoharie, N. Y.

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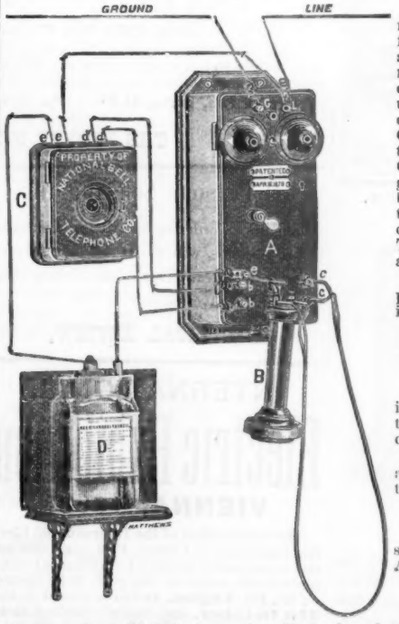

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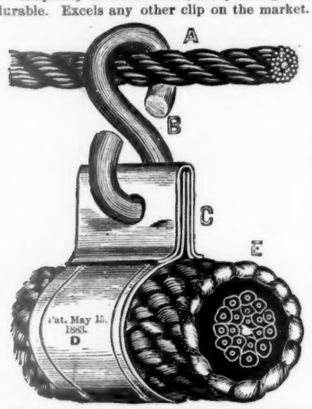

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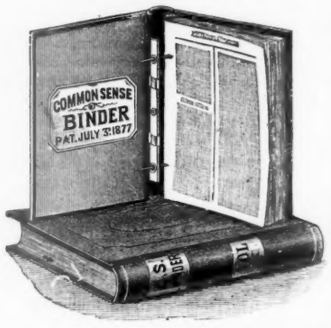

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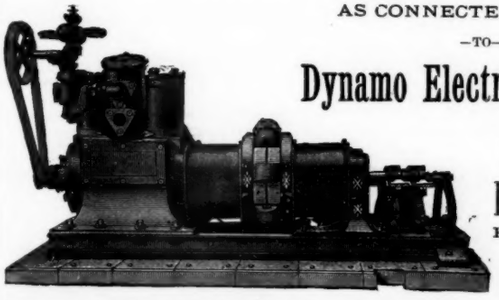

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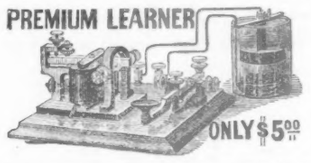

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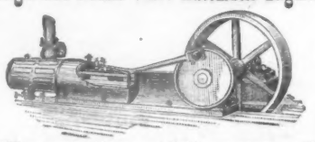

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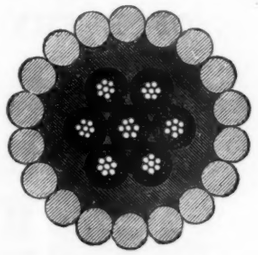

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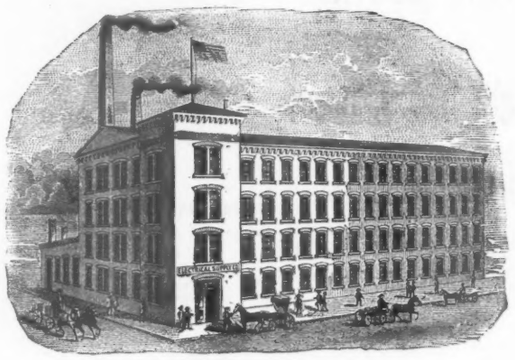

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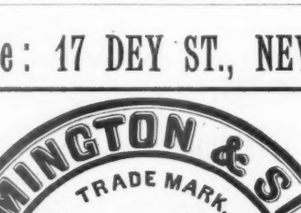

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